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# I

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VOLUME XIV  
NUMBER 4

# ASTOUNDING STORIES

DECEMBER  
1934

A STREET & SMITH PUBLICATION

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In all the history of science-fiction there has never been such a galaxy of stars gathered inside the pages of one magazine. I'm glad it's true. I've worked hard to make it true. And this month seems to sum up in the last issue of the year a record of worthy and palm-taking effort.

The twelve issues of 1934 stand in a row in our memories like soldiers on a crusade, but somehow as we check back each seems to have been a little more potent than its predecessor. Until, today, we bring you Smith, Campbell, Wendell, Graham, Collins, Gallun and Krass.

This is our Christmas present to you. If we were not sure of our growing strength we'd be spreading these words wide. But we're not doing that, because we know our path is right.

I know some of you have been bothered about space edges. I've given you all we can give within mechanical limitations. We haven't raised our price. We don't intend to raise it. We're giving you 48 pages, and more complete stories than the usual number of any other science-fiction magazine. In addition, written by Smith and Campbell.

We haven't spared expense. If you want our magazine to continue the instant your number is big enough to support us we'll give you the magazine twice a month.

A year ago this would have been impossible, but now great stories are coming to us fast enough to more than hold the pace.

The writers have grown with the new magazine. I feel that 1934 has been good—but looking forward I promise that 1935 can dim the glow of 1934 if you support our magazine as unfalteringly as you have so far.

To start the year we offer you *Star Ship Invincible*, by Frank K. Kelly; *Age*, by Clyde Crane Campbell, and *Vindicator*, Schachner, Gallun, Weisbaum and Krass, in the January number.

One by one we have added the finest writers in the field to our list—and the end is not yet. We are only just beginning to fight. Are you with me?

—The Editors.

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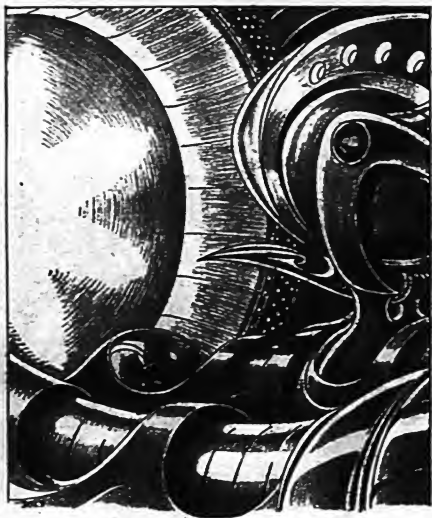
# ASTOUNDING

STORIES

VOLUME 10  
NUMBER 10

THE NIGHTSTAY MACHINE BY JOHN W. CAMPBELL, JR.





# THE MIGHTIEST MACHINE

*Part  
One*

*Illustrated by Elliot Dold*





*A novel of titanic scientific achievement, of voyaging into another space, and of fantastic civilizations and their colossal conflict—the greatest story yet told*

by

**JOHN W. CAMPBELL, JR.**

I SUPPOSE," said Don Carlisle with a look of disapproval, "that this, too, is the latest and greatest achievement of interplanetary transportation engineers." They turn out a new latest and greatest about once every six months—as fast as they can build new ships in other words."

"You should talk!" Russ Spencer laughed. "One of the features of that ship is the new Carlisle air rectifiers, guaranteed to maintain exactly the right temperature, ion, oxygen, and ozone content as well as humidity control. But, anyway," he went on, turning to his friend, "I wish you could have made this discovery just two years earlier. It was the dream of dad's life to build in the Spencer Rocketship Yards the first meteor-proof ship. You physicists were mighty slow about that. You've done the miracle now—I hope—but I wish you could have done it sooner."

Big Aarn Munro smiled his slow smile. "I wish I could have, Russ. But remember, physics is like a chain—you can't add the last link till all the earlier ones are in place." You don't know, perhaps, how much depends on that one discovery of the magnetic atmosphere. I couldn't have done it two years before, because then the necessary background hadn't been developed. Now, the magnetic atmosphere development of mine will serve as background for other developments. While you engineers have been working on this ship, I have, despite Carlisle's contemptuous references, been trying to prepare for another 'latest and greatest.'"

They had reached now, the base of the huge metal ways that supported the newly completed *Pracyon*, the Spencer Rocket Co.'s latest product. Nearly seven hundred feet long, two hundred and fifty in diameter, a huge, squat cylinder, it loomed gigantic. The outer hull of aluberyl, gleamed with faint iridescent color in the light of the few

great lamps scattered about the huge construction shed.

The hum and rattle of saws and welders were subdued here, all the work was being done inside now, and fleets of heavy freight planes were dropping gently into place on the helicopters, bearing loads of furnishings. Lights glowed in some of the ports now, and six huge, twisting cables snaked off across the littered yards to the main power board. The distant rhythm of the great power plant outside echoed faintly even here.

"She taking off on time, Russ?" asked Aarn, looking up at her.

"She should." The engineer nodded. "Barett said he was sure of his end. Trial run tomorrow starting at 13:57:30 o'clock. Just to Lampa City and back. And let's hope, Aarn, that your idea is right." A note of real earnestness had entered Spencer's voice now. "Aside from the fact that she means nearly ten million credits investment, which no one will insure on this trip, there will necessarily be seventy-three men aboard. And I'm taking your word for it and testing her in the worst of the Leonids."

Aarn nodded silently. Then he spoke again: "Physics says they will be safe from anything short of a ton. And meteors weighing even a hundred pounds are mighty rare."

"But it takes only one," Spencer reminded him, "and that one would mean neft ruin to me. My grandfather and my father have built up this business. I've had mighty little to do with it—only the last two years since dad died—but I don't want to see the tradition die. My grandfather built the first rocket to reach the Moon back in 1983. Dad built the first rocket to reach Mars back in 2036. Your father rode the first rocket to reach the surface of Jupiter. And mine built it. But naturally the old Spencer rocket has plenty of competition. The *Deutsche Rakete* people

being the worst—or best. They'll be on my neck if I lose this. But the little ships worked and, despite what they say about the big field not holding, I'm trusting your figures."

"I'm going along," Aarn smiled. "I'll bet my neck on it, anyway. Physics is generally a pretty safe bet."

"Umm—maybe so," Carlisle put in. "But you physicists have done a poor job on the subject of the atom. You've been promising us atomic energy and transmutation for 3 century, and you can't even tell why a chemical combination takes place."

"I hear," said Aarn slowly, "that you chemists have a theory that will account for it. And that theory also says that tungsten, in an X-ray tube, should radiate in the 'pale pink,' as Morgenthal expressed it."

"Well—that's as good as your physics atoms will do. You predict, similarly, that carbon will combine only with electro-negative elements. And X rays in the 'pale pink' are no worse than denying the very useful hydrocarbons. And we chemists have produced rocket fuels for terrestrial rockets, while you physicists haven't yet produced atomic energy for interplanetary rockets. Oh, you have a sort of bad compromise in the accumulator—"

"The accumulator is a very useful and compact device," Aarn interrupted, "which holds no less than thirty thousand kilowatt hours per pound—just a wee bit better than you chemists have ever hoped to do. I well remember that we Jovians waited twenty-two long years for release. Chemists made fuels eventually that would lift a ship from Earth to Phobos—Mars to Jupiter, but couldn't even begin to lift it back. So a few spirits like dad and mother and the rest of the people there just marooned themselves and waited twenty-two years till physics rescued them. Chemistry got them in, but couldn't get them out again."

"Yes; but chemistry made their synthetic foods for them meanwhile."

"Foul things," said Aarn with a grimace. "I was nineteen before I tasted food."

"They seemed to agree with you," said Spencer with a slight smile.

AARN MUNRO stood some five feet seven in height, and to those who did not know him, and his remarkable history, appeared exceedingly fat. He was nearly five feet in circumference, his arms and legs stuck out at peculiar angles, and they seemed misshapen.

Jupiter, a world with two and a half times the gravity of Earth, required strength in its people, and speed, too. On Earth, Aarn weighed nearly three hundred and fifty pounds. For the first twenty years of his life he had lived on the giant of the system and had developed such strength as no Terrestrial ever dreamed of. More than once he had proved his ability to lift and walk off with a ton and a half of lead.

"They did, chemically," Aarn acknowledged. "But I wasn't sorry to see a ship come in that could get out again."

"But," said Spencer, "if it wasn't for the nice stepladder of satellites, by the way, even Aarn's vaunted physics couldn't get a ship loose from old Jove's grip."

"That's true," returned Aarn; "but it doesn't enter the question, you see, because the satellites *are* there. Nine of 'em. So it's just a case of Jupiter to Five to Europa to Six to Mars. And what better could you ask?"

"I can ask a lot better," Spencer said, his voice suddenly sharp and annoyed. They had reached the main entrance port of the *Præyon*, but Spencer stopped where he was, damming up a stream of workmen, to talk. "I can ask for antigravity apparatus. If physics is any good, it ought at least to be able to say 'Here's the way to do it, but we can't just yet because of this or that,'"

and then find out how to overcome those difficulties.

"And I could ask for a machine that could generate power. Power from atoms, perhaps. This thing, this big hulking brute, it's a waste of water that this planet may need some day. Look at Mars—dry as dust. Almost impossible to get rocket water there. If it wasn't for the photo cells that give them power direct from the Sun, and make it possible to cook water out of gypsum, they couldn't live. Some day Earth will need water as badly, and this wasting of thousands of tons of water is a crime and a thousand other things.

"Damn it all, Aarn, why don't you do something? Chemistry is helpless. It's a job for physics, and you know it, and so does Carlisle, for all his bluffing. Why don't you do it, though?

"You've done a miracle already, and I know it, in making that magnetic atmosphere. The way it stops meteors and burns them into gas is a miracle; but not enough, we need more."

"We do, Russ, and I know it. That magnetic atmosphere was a by-product. It was a first step on the road, just the metal of which the key is made, purely incidental. I haven't been saying much, but I've been doing some extremely interesting work. And—I'm going to tell you a story.

"I saw a machine. It was the mightiest machine that could ever exist. It was an atomic, better, a material, engine. It burned matter to energy. Most of the energy was electrical in nature at one stage of the process, but it was converted to heat and light and other forms of energy. And one of those forms of energy was a curious field of force that could tear great holes in tremendous masses of matter, and there appeared coincidentally with that a force that seemed to hurl masses of matter greater than a dozen worlds like Earth, greater than mighty Jupiter, a million miles into space.

"It was a wonderful, pulsing, rhythmic machine and operated in a wonderful adjustment more delicate than any machine man ever made. Controlling unimaginable billions of billions of horse power, yet it remained in perfect balance with a variation in its output of less than one per cent. Controlling forces that could have hurled this planet about like a bit of dust, it remained in perfect equilibrium.

"It was a star. Any star. It was the Sun, the mightiest machine man ever observed. A titanic, inconceivable generator handling the power of three millions of tons of destroyed matter every second—and maintaining equilibrium. The explosion of more than three million tons of matter, really, regulated and controlled. Save that occasionally a great rent appears in its surface that could swallow all the planets of the system, and not be filled, or a tongue of flame a quarter of a million miles high and a million miles wide darts out, apparently lifting billions of tons of matter hundreds of thousands of miles against a gravitational force ten times as intense as Jupiter's—twenty-five times Earth's.

"But—does it?"

Aarn looked intently at Spencer, and slowly an expression of wonder spread over the engineer's face.

"Good—Heaven! Antigravity?"

"I only guess that, Russ. I don't know. But I want to have your help now. I need your influence to have all the space-liner captains make observations of a particular nature. And I need the observations of the lunar magnetometer and electrometer coordinated with a set of readings taken on Phobos and on Satellite Nine. If you get me those— And I've another idea."

Aarn turned and went on into the *Proryon* thoughtfully. The workmen who had been patiently waiting for the big boss to get out of the way started streaming through again.

## II.

IN THE super-patient tone one does when patience is nigh exhausted, Spencer spoke to the grinning Carlisle: "No. Spelled n-o. It is a syllable of negation, and refers definitely to the fact that that blistering, cockeyed son of an aberrating corkscrew, Aarn, has given me no tiniest bit of information. I gave him all the information he wanted.

"I then asked for one tiny spark of hope. Uhh! That isn't what I hope. That's not so good. Still—maybe—my theory may be wrong, but it may not. No; I don't know, Russ. I'll—' And then the clogged rocket goes wandering off on a triple-focus ellipsoid orbit. What he was going to do, I can't find out. He's as noisy as a clam playing hide and seek with his best enemy when he starts thinking. The worst of it is that he won't tell me anything at all."

Don Carlisle grinned again in sympathy. "I heard he was making noises like an oyster, so I came over to see. Whose lab is this, anyway?"

Spencer looked at him reproachfully. "Why bring that up? I pay for it, so naturally I can't get in. Since the Precyse rode out to the Moon and back through the Leonid meteor shower without a dent, the whole shipyard has been so crowded with orders I couldn't turn round quickly, and he's grown a head as big as Jupiter itself. Before this gravity stunt he was working on something else. 'Super-permeable space,' he calls it. Something to do with that 'magnetic atmosphere' of his."

"What," asked Carlisle, "is a magnetic atmosphere? I asked him once, and he explained something about a field of high permeability that did something or other to meteors so that they were electrified and so the field of special permeability became impermeable, and the magnet makes the meteors stop and blow up, because they are iron. Now I, in my simple, childish mind,

always thought a magnet attracted iron. It seems I was wrong."

Spencer grinned and answered: "It does. Up to a point, that is. What Aarn did was to discover a way of making lines of magnetic force do something—that gives us an isolated north or an isolated south magnetic pole. Also an electric charge. Aarn says that the magnetic lines of force that represent the other pole are turned through ninety degrees in space and become lines of electric force.

"Anyway, he has a single pole magnet and that proceeds to surround itself with a uniform magnetic field. It does attract iron and nickel and cobalt, of course, but when the metals fall through the magnetic field they have to cut the lines of magnetic force. In doing so they act as electric generators. Electricity is generated in them and heats them. But heat represents energy, and the heat they generate is generated at the expense of their motion.

"The magnetic field is so intense, and their velocity so great at first, that they are heated almost instantaneously to thousands of degrees centrifugal and explode into vapor. As vapor they are not dangerous, and nothing larger can get through. Except, of course, the huge things that are too big for the field to handle, but a meteor weighing five hundred pounds is almost as rare as a comet.

"In other words, this magnetic field serves for the space ship just as the Earth's atmosphere does for the planet. It slows the biggest, and stops and utterly destroys the little ones. It is extremely seldom that a meteor gets through our atmosphere. The magnetic atmosphere is almost equally effective."

"But why will a plain piece of metal, without windings or anything, generate current?" Carlisle objected.

"Say, Car, use your head. That's something you do know—eddy currents—why on that basis, why does a gen-

erator generate? Each wire is just a simple piece of metal. You've used the same principle a thousand times. Each electric power meter uses the thing in the control damper disk, the aluminum disk that rotates between the poles of a pair of permanent magnets. Anyway, that's not the important point. The big thing is that Aarn succeeded in making the lines of force lie down around the ship like a sheath instead of standing out like hairs on a frightened cat. It——"

"Hello, boss!" said a deep voice immediately above and behind his left ear. "Won't you come in?"

Spencer rose six inches from his chair in a spasmodic jump and turned on Aarn with a sour face. "You misplaced decimal point, if it weren't for my memories and loyalty to dear old Mass Tech I'd amputate you from the pay roll."

"Would you?" asked Aarn with a pensive air. When pensive Aarn's broad face and huge body succeeded in looking like a cow of subnormal intelligence ruminating on the possible source of its next meal. He did now. "I'd hate that, Russ. But I think you'd hate it worst. I got my super-permeable space condition. That's about the poorest name imaginable, so I've decided to invent a name. Be it hereinafter referred to by the party of the first part as the 'transpon' condition. Anyway, come on in."

AARN'S workshop was large and divided into two parts, the apparatus room, inhabited by four technical assistants who made up the apparatus Aarn called for, and Munro's own sanctum.

In Aarn's inner lab he had a series of benches and cabinets and tables. These were all loaded with junked apparatus, unused parts, spare voltmeters, and coils of wire. The floor was re-

served for the heavier junk that would have crushed the tables.

Spencer was quite surprised to see that one of the largest benches had actually been entirely cleared, and two sets of apparatus set up on it. Aarn smiled his blank grin again. Spencer knew from sad experience that that smile meant something completely revolutionary that would upset all his calculations and probably cost him, temporarily at least, several million dollars.

"Look," said Aarn.

He waved his hands toward the new apparatus he had set up on the bench. The apparatus consisted of two main groups. At one end of the bench was a squat control panel backed by a complex assortment of tubes, and a device that closely resembled the magnetic atmosphere apparatus connected with a curious wire cone. There was a standard a foot tall surmounted by a cone of copper bars running lengthwise to form the sides and around, binding the longitudinal bars in position.

The tip of the cone was a block of copper, the size of a golf ball. The mouth of the device was some four inches across and the length over all about ten inches. But the copper bars that formed the sides of the cone were carefully insulated from the block that was at the tip. From this block a single straight bar of copper projected along the axis of the cone.

Aarn smiled and turned on the apparatus. A low, musical hum rose from the tubes and coils, and slowly a faint blue glow centered about the copper block at the tip of the cone, and the pencil of metal that extended up the axis. For five seconds this held steady while a similar blue glow began to build up about the outer system of copper conductors. Presently, as this reached a maximum, the inner glow began to fade, then swiftly a pulsing rhythm was set up, first the inner, then the outer conductor system glowing more in-

tensely. The light settled down to a steady flickering that the eye could barely perceive, and Aarn smiled at it thoughtfully.

"The apparatus takes a few minutes to warm up. That's the first half. That was the hardest part, too, curiously, though this projector here is a far more important discovery."

Aarn pushed a second standard into view, which was surmounted by a metal bowl that closely resembled a deep soup dish. The inner surface was evidently a parabolic one, made up of a maze of tiny coils, each oriented carefully toward some definite aim, while the entire rim of the "soup dish" was a single larger coil.

Carefully Aarn adjusted it so that it pointed toward the flickering cage of copper wires, and beyond it to the apparatus at the other end of the bench. This apparatus seemed fairly simple, merely a number of standards with various arrangements of wires. Two, parallel copper bars, a double spiral made of two insulated wires, two metal disks.

"Those," said Aarn softly, "are simply connected with the normal power supply. It is alternating current of sixty cycles at two hundred and twenty volts. The device I have is a pick-up. It will collect the power from those wires. The projector here is the real secret—it makes space itself become a perfect conductor of electric-space-strain. Not electricity. Electric-space-strain. But the result is the same. It makes the space along its axis capable of carrying power along the axis—and along the axis only. When I start this, the space between here and that interrupter coil back there will become a perfect conductor. The interrupter coil is necessary to prevent the thing reaching on out indefinitely.

"The pick-up there will be in that path of conduction, and so will the first of those lead-offs there. That pair of

straight wires. The wires will not be mutually short circuited because this will conduct current only *along* the axis. But the pick-up there keeps sending out flashes of a somewhat similar energy at an angle so that it covers the entire column, and so can pick up the power in it.

"I can't make that pick-up work continuously because the energies would then interfere and simply short-circuit things. But I can make it work at any frequency from one cycle a second to about fifty megacycles. Now I'm going to adjust it to sixty cycles, and it will get in step with the power on the two leads—and run that series of lights and that motor."

Aarn pushed a switch. Instantly three tumblers snapped over automatically, a powerful surge of power seemed to draw at the men themselves momentarily, and then the little flickering pick-up was sending out searchlight beams of brilliant ionization. They started out along the shape of the cone, spread rapidly, till they filled the tight, round column of power coming from the transpon condition projector, then the ionization stretched along like a luminous liquid flowing in a pipe.

"The thing isn't in phase—wasting a lot of power," said Aarn.

He began adjusting a dial, and the slight visible flickering vanished as the frequency rose. Suddenly the ionization all but vanished, leaving only a slight glow about the pick-up itself. Then an instant later it was back, but vanished again. Each time the ionization stopped, the lights glowed, and the motor Aarn had pointed out hummed into speed.

PRESENTLY he had it exactly adjusted, and the lights burned steadily, the five-horse-power motor continued smoothly.

"The efficiency is about seventy-five per cent, which is not very good, I'll admit—but good enough for what I have in mind."

Spencer was looking at the device intently. At last he asked: "But why doesn't the pick-up short-circuit the thing when it has thrown out its pick-up force? It throws a conducting band or disk completely across the tube of the transpon beam, as you said you called it. That will carry current at right angles to the axis, so it lies completely across the two terminals of the wires."

Aarn smiled grimly. "That, Russ, is why I took nearly nine months to do this. I had to prevent that. The answer is that the lock and the grid don't project the same force. The grid projects a force which will accept only a negative electric force, while the block will accept only positive. Therefore it can't short-circuit."

"Then it rectifies, too? Some little device! It's a thing we've sought for a century, Aarn—power broadcast along a beam."

"No," said Aarn sharply. "That's the point—it isn't broadcast along a beam. A beam reaches out and picks it up. The difference is as great and as vital as the difference between being hit and stopping something going by. If a man's fist connects with the button, your jaw absorbs kinetic energy. He has broadcast it along the beam of his arm."

"But if you reach out and grab hold of a man running by you, you have reached out for and taken hold of a source of kinetic energy and momentum. Right?"

"Hm—hum! Distinct difference. But why does it count here? What difference does it make?"

"Nut—a system of difference. No beam any man ever made could hold an absolute beam—a fixed diameter and cross section from here to infinity. Any power beam you make has to carry so much power per square-inch cross section at the point where the power is picked up. Suppose I'm sending power by a beam to a ship going to the Moon.

On Earth the beam is ten feet across. Fine, the ship has an absorber or pick-up twenty feet in diameter, let's say. When the ship is fifty miles up, the beam and the pick-up are the same size. At one hundred miles the beam is wasting seventy-five per cent of its power because it has to maintain a certain power at the ship, and only twenty-five per cent of the beam is impinging on the target.

"Now—take it the other way. If the ship projects the beam, the earth power station is simply plugging power into a funnel. The energy can go only one way, and no matter how widespread it is at Earth, it has to get out on the pick-up in the beam. It's bound to be infinitely more efficient after you get more than ten miles away."

"Slightly," agreed Spencer with a smile. "So hereafter ships won't carry accumulators, eh? Just send back a beam and pick up power from Earth. But say—how are they going to be made to pay for it? They could tap any power source or any line on Earth?"

Aarn smiled and replied: "In the first place, they won't get their power from Earth, and in the second place, just suppose you sent back one of the beams to tap any sixty-cycle line on Earth. What would happen? First, you'd have to get in phase with some one of the big power-line networks. Then, bingo, you have everything from one hundred and ten to one hundred and ten thousand and above volts coming smashing along. It would blow you to kingdom come and wreck the apparatus. Might do some damage back on Earth, but I doubt it."

"Not get the power from Earth? Where then? Not from one of the other planets surely, because they have power troubles of their own."

"From the mightiest machine!"

"Good Heaven! The Sun! Do you mean that thing could tap the awful power of the Sun?"

Spencer's face was suddenly pale. He could visualize that beam as though



a visible thing reaching from some tiny dust mote out across space to impinge on the Sun, and drink of the power in that million-mile electric furnace, where matter was smashed beyond atoms, ground to radiation.

"The Sun," Aarn nodded. "It's hard to think of all at once. Tapping the mightiest machine—the most inconceivably huge engine in the universe really—for any star would do. Making a star supply your power. A furnace that consumes nearly four million tons of matter a second.

"It's simple really. You need a power stack, of course—a huge supply of power storage to operate your machine when you were not in position to tap the Sun. It would require only a modification of this device—one I have worked out completely, and we could draw a billion billion horse power in direct current at any voltage you wished up to a maximum of about five hundred million, which would make insulation impossible in any circumstances."

"Then—unlimited power—and I thought—it was just a new power-transmission device. Atomic energy! Man could never build—of course he couldn't make one as big—a sun—two million million million tons of engine—three hundred thousand worlds like this—"

He laughed suddenly. "Car, you wanted to know why physics didn't give you the atomic energy they promised. Here's physics answer! Atomic energy would be too expensive—require too elaborate a control—so physics taps a sun!"

### III.

"THAT," said Aarn quietly, "is one of the things I promised. Now that we have the power I promised, I think I can also promise the antigravity device."

"Antigravity, too! Say, Aarn, there won't be anything left to find after you

get through with physics. But can you? How—"

"The Sun gave that secret, too. It is because the terrific forces beneath the surface cut off the gravity that those huge masses of matter can be ejected to form prominences. I was right—and the data that men out in space collected gave me the necessary basis for my problem's solution.

"Look—for a century or more men have known that there were three types of space-strain energy fields. There is the electric-energy field and the magnetic-energy field, which are mutually at right angles to each other. My 'magnetic atmosphere' device simply turns half of the magnetic field through ninety degrees and makes it an electric instead of a magnetic field pole. That was simple.

"But—gravity has no poles. Gravity is fourth dimensional instead of in three dimensions. I found out the answer, thanks to the Sun. Remember, it takes a three-dimensional thing to have two different types of stresses. Take a rubber balloon as an example. The rubber can be dented inward. A strain along the diameter of the sphere. But the rubber becomes stretched on one side and more or less piled up on the other. Those two types of stress are at exactly ninety-degree angles." That represents magnetism and electric field.

"Obviously if we dent the balloon inward in one place, it will stretch outward somewhere else to make up for it, perhaps all over, but a swelling takes place. That represents the fact that a north pole is always associated with a south pole somewhere or other. If the fabric is stretched along its surface, it is thinner in one place, but inevitably piles up elsewhere. Where there is a positive pole there is necessarily an accumulation of negative somewhere.

"But our rather poor illustration doesn't explain just how the ninety-degree twist is possible except generally

in that, if the balloon is dented, if the fabric stretches, there is no actual dent outward. Our model is poor, because space is four dimensional.

"But you see that it requires a three-dimensional medium for two stresses at right angles to each other. It requires four for three right-angle forces. And the curious thing about that four-dimensional stress is that it doesn't have polarity necessarily. But there is a reverse condition. In magnetic and electric fields, opposites attract. In gravity likes attract. That is characteristic. Opposites repel.

"I can make the gravity curvature—given energy enough. I can also make the reverse curvature of space. But before I can reverse curvature of space locally, I have to iron out the normally present gravitational curvature. Any space strain is energy. It requires enormous energy."

Aarn got off the bench where he had been sitting and started clearing away his last demonstration rapidly, setting up a new group of apparatus.

"Suppose we wanted to free a mass of gravity. To flatten out the local gravity, we have to overcome its own gravity. You know the old lines-of-force picture of magnetism, Spence. You can use that lines-of-force idea on any of the three space fields. In the gravitational picture, it works something like this: the attraction of the Earth for a small body, like this lead weight, for instance, is equalled, of course, by the attraction of the small body for the Earth. If you think of it as lines of force, picture the lines about a small piece of iron in the field of a powerful magnet. The magnetic lines of force bend into and pass through the piece of iron.

"Suppose we wanted to wrap a coil of wire around that bit of iron, and make it 'magnetic-weightless,' so to speak. We would have to build up a magnetic force in our coil that opposed

the greater magnetic field and bent the magnetic lines of force away. Then really, in demagnetizing our little piece of iron, we are having to overcome the big field in which it is at least locally.

"Ditto with degravitation. We act as though we were merely trying to make the piece of lead we are working with stop attracting, stop being a source of gravitational force, but in order to do that we have to overcome locally Earth's field, the Sun's field, and all the fields of the universe.

"Actually, of course, this is too much work, and for practical work I will overcome only the solar-system fields. But, even so, that represents a lot of energy. The law of conservation of energy demands that I supply energy equivalent to lifting the degravitized body completely free of the fields by distance, lifting it out to infinity in other words. That's equivalent to the kinetic energy it would have at about sixty miles per second."

Aarn paused. He had his apparatus set up—a strangely shaped series of coils surrounded by a pair of heavy metal plates. A hollow space of about a thousand cubic inches remained in them, and in this space now Aarn was arranging a lead sphere suspended from one arm of a long-arm balance. It was balanced at the other end by a group of weights totaling five pounds.

From the coils two heavy copper cables ran, twisted, off to the main power board on the other side of the room. His apparatus ready, Aarn walked over to the panel and laid his hand on the main power control.

"Ready, I guess. Keep an eye on that lead, Spence, and see if you can keep it balanced!"

Aarn flipped a small switch, a relay thunked over, then rapidly he advanced his controller. For perhaps ten seconds nothing happened.

"Induction—she's building up a mag-



*The strange device darted through the window at a speed of at least seventy miles an hour.*

netic field in there now, and an electric pole, too." Aarn explained.

Then—abruptly, yet leisurely, the weight pan of the long-arm, balance sank.

"The weight's going!" called Spence excitedly.

"It should!" Aarn grinned. "She's drawing two thousand horse power."

Carlisle watched interestedly as Spencer took weight after weight from the balance pan. Still the scale remained steady. "It's two and a half pounds now——"

"That's about enough," decided Aarn. "I just wanted to show you."

"Can you make Earth's centrifugal force throw it up?"

"I could—in about four and a half years with this power source. That thing begins building up a back force that makes it hard to pump in juice. That's not the latest design—I've found ways to improve the thing since that was made, which will all be incorporated in the real apparatus. Further, remember, while that's going down fairly fast now, destroying weight is like filling a fuel tank. You can fill a vacuum a lot easier and faster than you can a fuel tank with two tons per square inch in there already. It will begin to show up pretty quickly now. When the weight gets down to about five hundredths of a pound, it will go very slowly."

Aarn reached over, and made some adjustments on his power board, and all but two meters dropped to zero.

"I'm just holding that now. There's no need to de-weight it, is there? We can't do anything real till we have a big job, and a Sun-tapping beam to run it. It builds up an electric-field back-force of several thousand volts; that's what was stopping that then. With the Sun-beam and a big model I can demonstrate. And—uh—well, I have something else, too. But I'm not ready yet," Aarn hastened to add.

SPENCER had started up expectantly when Aarn said he had even more. Now he looked at him disgustingly. "As I told Carlisle, you're as noisy as a clam in hiding when you've got something interesting to puzzle about. Now let me ask a question: How do you know that Sun beam will work? Have you tested it on old Sol?"

Aarn smiled faintly and waved him away. "This isn't my home planet—but even so I like it. I said that got power from the Sun. The ionizing layer, my lad, conducts. Could you imagine what would happen if you short-circuited the Sun? That's why the ship we're going to build as a testing laboratory—we'll need a space laboratory now, and it'll cost you five millions, Spence, my boy—will have a huge bank of these new storage devices.

"You know how much energy accumulators will store. These gravitational coils will store electric power at high voltage and about one thousand times the capacity per pound. We need the storage for the times when we are in an atmosphere, behind a planet, or similarly hindered. Here's a point to remember—you can't have those Sun-beam ships wandering about aimlessly. They'll have to be very strictly limited. One of those fellows could cut a swath through any other ship."

"Whew—what a weapon!" gasped Spencer as he pictured it. "Cut a world in two with that and the Sun's power."

"Uhm—deadly enough if you could get in position, but that beam is tender in its way. If you just remember these two facts you'll see why it really isn't much of a weapon, and isn't to be greatly feared on the score of blowing up a world. That it could be dangerous to a certain extent, is of course true. But remember, that world will have the first chance to put power on the beam. Suppose you are waiting for that beam, and the instant it hits your world you unload a few million volts and a hun-

dred thousand ampere-hours of accumulators on it at just the frequency it's turned for? Good-by, projector.

"Or suppose you have your beam already developed, reaching from ship to Sun, it would take about a quarter of an hour to develop a beam from the Earth to the Sun because of the finite speed of light—and just wait for the world to move into it. You have to send a signal down the beam which determined to what extent you are going to tap the Sun, naturally, or the Sun would just send a flood that would wipe you out before you could shut it off.

"Then if you signaled for unlimited power, so that you could really damage a world, you'd be wiped out first. And always you have to wait the quarter of an hour or so for the energy to make a round trip—and if it's war, somebody will be out looking for you with something bigger than a mosquito spray."

"I shouldn't have cared to develop it if it had been as dangerous as it might have been," Spencer said quietly. "But then why did you say you couldn't use it in an atmosphere?"

"Short-circuiting the beam is the signal for unlimited power. Hold it on long enough, and you'd get the power."

"Right enough, and tell me why I have to build that five-million-credit flying laboratory," demanded Spencer.

"So I can test out a few things. And—uh—don't put any rockets in it. Get out the lab here and let me work."

Wherewith Aarn reached out two great arms like tree trunks and lifted Spencer in one hand and Carlisle in the other, deposited them outside his door and locked it.

Carlisle looked at the door sourly and brushed himself. "He didn't have to do that to me. I wasn't so damn interested I had to be thrown out."

"Oh," said Spencer hopelessly, "that guy's got my psychology down to a hair line. He knows I won't be happy till I know why we won't need rockets. How

in the name of the Nine Wandering Worlds is he going to drive a ship in space without rockets. I can accept his antigravity, because we've known that was coming for a century.

"His Sun beam as he calls it—that's as breath-taking, as utterly original and brilliant as anything man ever did. The colossal, unmitigated gall of a man that will light his cigarette from the fires of the Sun! It would take a man without nerves, without fear, to think of anything as utterly outrageously and gloriously bold as to tap the mightiest machine, as he well called it, for power.

"But now that he's done it, any one can see that that's the obvious source of power.

"But what's that next stunt?" he, too, looked at the door with anguish.

The door opened abruptly and Aarn's head appeared. "And, Carlisle, I'll further demonstrate that physics' theories of the atom have their uses."

The head disappeared.

A slow smile spread over Carlisle's face as he looked at Russ Spencer. "I'll bet that information was just enough to give you a complete headache," he said gravely.

#### IV.

"CAR," said Spencer with bitterness, "it's a pleasure to call you in here. It's a great soothing agent to have some one pay some attention to you when you ask him to come. For the past week I've been asking Aarn to take an hour off and come have a conference on the ship. The framework plans he sent have been converted into steel and aluberyl. The plates have been welded on. The thing is now a completed hull. And Aarn won't come."

"Has a name been picked for it?" asked Carlisle unsympathetically. "If not, may I suggest *Little Sunbeam*?"

Spencer looked even more aggrieved. "Little credit-eater would be more ap-

"propriate. It has cost me two and a half million so far."

"What?—Two and a half million? How come if it's just a hull?"

"Oh, he had a lot of machinery made for it—lot of stuff all ready to install, but he hasn't had time to get around to—"

"Great spaces and little meteors! What was that?"

The entire office building was still trembling and shaking to the sudden strain. It had been a violent howl of terrible wind, an abrupt clutch as of starting space ship's acceleration, a wrench and quiver that shook the very ground and rock beneath them. In the instant that straining yank endured, the wind became a live, shuddering, whining thing that whimpered in terror and rushed into some unknown thing.

The telephonescope clucked and buzzed suddenly. Spencer reached over and flipped his end on, and instantly Aarn's face appeared.

Russ beat him to the draw: "What," he demanded, "in the name of the Nine Wandering Worlds did you do that time."

Aarn smiled slowly and answered: "Miscalculated. The range wasn't controlled right. It is now. Want another one?" He disappeared for an instant, and during that instant the yank and strain and howling wind reappeared. "I have," announced Aarn slowly, "proved a further use of physical atomic theory. And I will come over. How far is it from where I am to your office?"

"Seven and a half miles," answered Spencer blankly.

Aarn disappeared from view; the telephonescope went blank. For some seconds Spencer continued looking on the screen.

"But why do you want to know that, you knew it already?" he asked inanely of the blank screen.

"Open the window for him, will you, Spencer. I'm lary."

CARLISLE waved a negligent hand toward the office window, a wide sheet of crystal-clear glass that opened on a pleasant rolling mountainside, for Spencer's office was in one of his own buildings. Just now the view was obscured by Aarn's ponderous figure. He was apparently lying on a metal beam about an eighth of an inch thick, and six feet long by ten inches wide, floating in the air. At the forward end of it was mounted a torpedo-head shaped object which evidently acted as combined air break, engine room, and control panel.

For at least forty-five long seconds Spencer stared blankly at the figure calmly lying there. Then Aarn's annoyed voice came through the window: "The walrus is getting a bit tired of being stared at. Open the window and let me in."

Spencer opened the window with a jump and dodged out of the way as Aarn's strange device suddenly spun on an axis about the engine head, and darted straight through the window at a speed of fully seventy miles an hour, and instantly stopped dead in the center of the room.

"This," said Aarn calmly, settling himself as though on a couch in the middle of the room and resting on air, "represents a model of our ship laboratory. You noticed the speed I made in coming over. It is seven and a half miles. I came at a speed of nearly one thousand miles an hour, because this device can accelerate and decelerate rather rapidly. I would have been able to get here sooner, you see, if I had had better control. But I have had this thing in working order only about six hours."

"But what is it, you asteroid? What is it?" demanded Spencer, trying to get near it, but it moved away with delicate precision each time he approached.

"A model of our ship lab. It has

antigravity, of course. Improved, I may say. I can't dismount here, and every time you try to enter my de-gravitational field the thing shys away, because you have weight.

"That is not new. But the little device I use in driving it is new. Now look here."

Aarn raised the metal hood of the torpedo-shaped head and displayed the several pieces of apparatus contained therein.

"That is the antigravity device. It is charged now with nearly fifteen thousand dollars' worth of your power. This is the storage apparatus. It stores up the power I need for running the thing in a type of gravity field. Remember that a gravity field represents an energy storage also, but more intense storage is possible than in magnetic or electric. In this little thing is about three thousand credits' worth of power.

"The third and fourth devices—here and here—are really interconnected and balanced to work as one piece. They are the momentum and kinetic energy devices. Both momentum and kinetic energy involve time, remember.

"But the important thing comes from the wave-mechanics consideration of matter and energy. Remember that an electron is like a photon—it behaves both as corpuscle and as wave in various conditions. Wave mechanics explain that something like this: the electron is always a wave, but can behave like a corpuscle because the waves which make up the true electron and extend through all space—to infinity and back—interact and pile up in one place to make a noticeable knot of energy we call an electron. In only that one limited place do the waves pile up and add to each other. Everywhere else in all infinity the waves are so arranged as to cancel out, but they are there just the same.

"That is one phase of the wave-mechanics atom. And it is the phase that so annoys Carlisle here. He can't make

his waves react and produce sulphuric acid.

"Seriously, I agree that is an objection. But you see one of the things a consideration of wave mechanics produces is very interesting. It is really two things—two formulas. One shows that momentum is something of the nature of a wave formation. The other shows that velocity also is a wave formula.

"In other words, if we could produce the right waves, we would have momentum synthetically produced, and the same for velocity. That means momentum and velocity can be 'tuned in,' and we have that long-sought thing—a driving device that reacts on space itself. Not the empty space you see outside the portholes of a rocket. The physical space of gravitational fields and dynamic strains, of tremendous moving fields of force that tug and weave and pull. Space isn't empty. It's alive with a billion billion strains and stresses. They are physical and real and solid.

"And there are the infinitely extending canceled waves of every electron and every proton in space. That space is solid, firm, something whose fabric is tougher than any metal ever could be. That's the space this device works on.

"It's an oscillator that sets up an oscillating field of force about itself that extends for some ten feet in all directions at full power, lesser distance at lower power, and somewhat modified by the presence of matter within it. It is an oscillation between magnetic, electric, and gravitational fields of force, a circular motion through those three of perfectly inconceivable frequency. I don't quite get it myself.

"Only I can control it. Doesn't take the amount of energy you'd expect because, remember, it isn't like the blessed rocket which has no relativity. This has. It takes about ten times the energy you'd expect for high speeds, and actually produces energy at lower

speeds. I can measure an 'absolute' speed with this. I can determine the velocity of the universe—or this part of it, at least—relative to Earth.

"This catches its fingers in the web of space, and I can either drag on it, or push on it, but it does have that relative base, whereas the rocket, with no relative base to work against, of course, apparently violates all laws of physics—at least two of them."

"But how about the velocities we use in interplanetary work?" demanded Spencer.

"Comes under head of low velocities. Doesn't matter, anyway, because you can tap the Sun for power. But it is providential that we don't have to obey the laws of physics when we use rockets. Otherwise we'd never have got anywhere.

"NOW for a ship the size of the one we will have—about five thousand tons, I calculated—since we are eliminating the heavy double hull, and most of the weight of the outer one, with the magnetic atmosphere—that will be helped any time we have an antigravity field, because the antigravity—I call it an 'aggie' field, by the way—tends to bounce anything coming toward it. The incoming gravitational field, which is what the meteor represents, is repelled by the aggie field.

"To go on; a large weight will be added, however, in the power stacks. We'll carry nearly a thousand tons cargo of power apparatus. With that we can give a jolt that would smash a small planet."

"It would," agreed Spencer: "but inasmuch as it would also smash a large bank roll, tell me, pray, why your soul cries out for such luxuries. What's all that power for?"

"Intense fields, there are peculiar effects when the fields become intense. I might find the secret of the destruction of matter if I could get a sufficiently in-

tense field. Remember, while this Sun-tapper beam is wonderfully better than a rocket, it's a darned inconvenient form of power supply."

"It would take you a year to charge the fool thing," objected Spencer, "even with the Sun beam. You couldn't carry that along your copper bus-bars fast enough."

"Quite true! That's why we'll use power beams. That and the fact that I want to see what power I can send through one of these accelerators. You know the beauty of this form of drive is that there is no feeling of acceleration, since, naturally, all the particles of matter are accelerated individually. You'll be quite weightless in this thing—except for artificial gravity.

"In the meantime, I'm at last ready to discuss this ship thoroughly," acceded Aarn with a smile.

"Uh—you are? Well, I'm ready to discuss that new device. I've got a ship on the ways; it's going to be the *Daniel Spencer* and carry one thousand passengers. The present idea was to have it equipped with magnetic atmosphere, your so-called aggie field, and Sun-beam apparatus. By the way, that gave me a headache—trying to figure out a way to keep the beams pointed at the Sun, and yet not be able to cut across the ship accidentally on a sudden turn. A complicated mess of gyroscopes that's worse than the automatic navigational control, but it will do the job. And now this new stuff has to go on her right away."

"Her? I thought you said it was the *Daniel Spencer*!" Aarn said mildly. "At any rate, I'll have to give you data for it. There's plenty of work on the calc before you can begin. The installation depends on the mass, distribution of mass, and so forth. Now look—"

Carlisle listened patiently for half an hour, then fell into a peaceful, resting sleep.



## V.

THE OFFICIAL title of the craft was to be "Spencer Laboratories No. 6." Being human, Aarn wanted to make it capable of a lot more than merely plugging around in space and experimenting. He loaded the design with plenty of aggie power storage coils, and he made the momentum-wave drive apparatus a lot more powerful than was really necessary. The antigravity apparatus was designed to be able to lift the mass of the ship laboratory, away from the very surface of the Sun, against a gravitational acceleration of thirty earth-gravities.

"All in all, Aarn made that ship an extremely powerful machine. But then—she was designed for experiments.

She was three months building on the Spencer ways. They rushed her construction, too, for many of the devices that Aarn planned to incorporate in later designs needed testing in actual operation. Her hull of beryl-steel was finished within two months, but the new labor of installing the strange devices took time and experimentation, careful accurate balancing, lest failure be due not so much to defect in plan, as defect in execution.

The final test, her maiden flight in space, Aarn wanted to make alone. "I can operate this thing alone, just as easily as I can with a crowd along. I'll let Canning here go—I might need one technical assistant."

"The air apparatus might break down," suggested Carlisle, grinning. "You'll have to take me to be safe."

"The financial apparatus has already nearly broken down, so you'll have to take me. I need a rest." Spencer groaned. "They say I'd be bankrupt now if it weren't that I've got so many orders coming in we can't fill 'em. Man, you may be good in physics, but you don't know how good you are at spending money. I've spent three or four

fortunes having dies cut for the apparatus in this boat. This is my little ray of light and hope—if it doesn't come back, I never want to know it. I'm going along."

"Maybe some pirates will hold you up for ransom," suggested Carlisle cheerfully.

"Speaking of your little ray of light and hope and pirates makes me think. This thing needs a name—not a designation, a name. This is our little *Swabrow*—and may she raise some blisters. She would, by the way, if she hit something going at her maximum," suggested Aarn.

"And if you insist on the whole neighborhood coming, bring Martin, anyway. I want some more meals. If you really want to know why I wanted to go alone, I wanted to go back to Jupiter. For once in my life I could go home without having almost to buy the ship that took me there.

"If you are so insistent, come along, and we'll make it a party."

Three days later, the *Swabrow*, with five aboard her, took off gently. Up through the great ceiling of the Spencer plant, she angled slowly. She was rising on pure lack of weight, by centrifugal throw. Presently a Spencer salvage ship came over, dropped a huge tow-magnet on the ship, and both rose swiftly into the air. Aarn was afraid to try out the new drive on so powerful a ship when near a planet.

Her crew on that trip that was to lead them to infinity and beyond consisted of Aarn Munro, Carlisle, Spencer, Canning, Aarn's chief technical assistant, and Henry Martin, chief cook and bottlewasher for the expedition.

THE TOW SHIP carried her out of the atmosphere and then fell well behind. Gently Aarn stirred in his seat. "And now comes the test. Do we move too slow or so fast we can't handle it?

I'd hate to have to charge and rebalance these circuits. Anyway—"

Gingerly he advanced the acceleration control. Softly, behind them the great transpon beams began to hum. Inaudible, invisible, almost undetectable momentum waves began to bite deep into space and thrust the great mass of the ship forward.

The control at one, the *Sunbeam* moved off under one earth-gravity acceleration. Aarn moved his control to two. A frown came across his face, then a soft whistle of surprise. His accelerometer had moved over to eight!

"Sweet spirits of space! I was over-conservative. I thought I might not have that figured quite right—and I didn't. I'll have to cube every one of these readings here—and the top one is one thousand!"

"A million gravities! We can't stand that, can we?"

"Well, if the ship can deliver it as a momentum wave, we can stand it. Right now I'm going to take a little run down to old Sol and charge up."

Aarn turned the *Sunbeam*, till the electric-blue flame of the heart of the solar system flared in the forward control window. Slowly Aarn advanced his control. At first no visible change occurred, save that Earth fell away; then it was lost from view as it came almost directly behind. Only the one-hundred-million-mile-distant Sun remained visible. Then, slowly, even it began to change, more and more swiftly it expanded, till Spencer sat gripping the arm rests fiercely. The tremendous distance to the Sun was being cut down visibly.

"Fifteen hundred miles per second," said Aarn comfortably, "and rising smoothly." Heaven help the meteor we hit. I've got the magnetic atmosphere at full force and tied it in with the whole aggie-coil system. If we hit anything now, it'll get hit first by the magnetic atmosphere, then the antigravity field,

and finally the whole impact of our momentum-wave system. We've got the momentum of a major planet packed into a space one mile in diameter!"

"Yes, but suppose we do hit something—the Sun, at the rate you're going now—and get cooked?" suggested Carlele uncomfortably.

"I'm slowing." Aarn laughed happily. "Spence, you've got a ship as never was before!"

"Don't I know it? The system record for speed is only one thousand, six hundred and thirty-one miles per sec."

"Was, Spence, was—we're doing about eighteen now. And I'm going to stop her dead!"

Aarn threw over a tiny tumbler—his emergency brake. Instantly a terrible crashing roar thundered out of the power room behind as the transpon beams suddenly felt the impact of countless billions of horse power. Under an acceleration of one million earth-gravities, the *Sunbeam* came to rest and stopped. Not the slightest sign of strain or stress did the men aboard her feel as their "weight" was suddenly increased to around one hundred thousand tons each.

"The *Sunbeam*," decided Aarn judiciously, "is thirsty. We'll give her a drink at the fountain of power—old Sol!"

The *Sunbeam* has started out with barely one tenth of her maximum charge. This had been brought in laboriously by the smaller ships, the Spencer salvage corps. These ships had been equipped with aggie-coil power racks, and transpon beams. The small coils had been charged, then drained into the greater coils of the *Sunbeam*—a ferry system for power, since the transpon beam to the Sun could not safely be used through the atmosphere.

Now the *Sunbeam* was about to drink deep of solar power. A brief roar of sound from the power room told of the establishment of the powerful fields that

were projecting the transpon condition through space at the maximum velocity—one hundred and eighty-six thousand miles per second. The Sun loomed gigantic, unbearable, less than thirty million miles away.

Swiftly the silent minutes passed as the five men waited for the return of the power up the beam. Four—five minutes—then with a terrific roar that dwarfed the former protest as the *Sunbeam* was brought to a dead stop, the power came in.

For ten long minutes the roar continued, before Aarn swiftly cut it down, and as he cut it, the hitherto invisible transpon beam reaching from ship to Sun became visible as the excess energy flared off in waste light and heat. In three minutes more, the *Sunbeam* was fully charged.

"She's charged, and ready to ride!" Aarn sighed. "To Jupiter we go—and I'm going to wind up some speed this time!"

The *Sunbeam* turned, and Jupiter rode into view, five hundred million miles away. To the left, Mars glowed dully red-green. Aarn pushed his controller over slowly. Farther and farther. Then slowly, infinitely slowly, Mars began to expand, more and more quickly till it was ballooning swiftly and with a sudden rush swept by them. They were lifting now, lifting in a great arc out of the planetary orbits, up and over the meteor-infested asteroid belt. Five—ten million miles. A needle on a dial before Aarn was quivering against its stop pin, the last reading: forty thousand, well behind it. The *Sunbeam* was going over fifty thousand miles a second.

"She's rolling!" Aarn grinned. Skillfully he looped gently back into the orbital plane, as he snapped his controller back to zero, reversed a tumbler, and pushed up again for deceleration. "We haven't room in this puny little system

for this baby—she needs free space to work right."

AARN was right. The *Sunbeam* needed free space to work in. Invisible, a dark, jagged mass of age-old broken planet, riding in one of those ultra-eccentric, unpredictable orbits, was far, far out of the asteroid belt. One hundred tons of solid, tough nickel-steel, the same sort of stuff men had been collecting for a century from space to make armor plate.

Aarn was right when he said the *Sunbeam* had the momentum of a major planet—concentrated. Traveling at about forty-two thousand miles a second, slightly less than a quarter of the speed of light, the *Sunbeam* struck that hundred-thousand-ton mass of metal.

For the millionth part of a second, Aarn caught a glimpse of that jagged mass, suddenly illuminated by the light of the Sun—then the magnetic atmosphere struck it. Driven by the full-fed aggie coils, now charged from the fires of the Sun, the magnetic forces shrieked horribly and ripped the mass to incandescent gas in a hundred thousandth of a second. Then the individual molecules slipped unresisted through the forces—still with a mass of a hundred thousand tons. The gravity field and the momentum waves struck it simultaneously.

Space itself shrieked under the impact. Torn by forces beyond even its endurance, space tore open—the *Sunbeam*, part of the now-gaseous meteor, and the contending forces simply dropped through to where neither force nor mass nor energy had meaning.

IN THE space liner *Aldebaran* Captain Arnold Barrett wrote in his log book:

"At 13:45:30 o'clock, May 14, 2079, a terrific burst of light appeared about ten million miles away, out of the plane of the orbits, and persisted for about

five minutes, dying gradually away. It was a curious ring-shaped light, dark in the center for a moment, then suddenly bright as though with a violet sunlight shining through from beyond, then dark again.

"For some time, not even stars beyond this blackness showed, but gradually they reappeared. The duration of the blackness was accompanied by certain peculiar phenomena described by Chief Engineer Rand.

"Chief Mate Matterson reports definitely that he saw a new-type ship, believed to be the new experimental ship of the Spencer Co., moving toward the point where the phenomenon appeared shortly before it happened. Matterson reports also, however, that he could see the ship moving against the background of the stars. The distance must have been over ten millions of miles, so he is probably mistaken. No ship could move visibly at that distance."

*To be continued.*

*The Sunbeam has disappeared from space as we know it. She has started on the first leg of her colossal and incredible journey into realms hitherto unsuspected by man—crashed her way into "another space"—wholly different, staggering in its titanic proportions, filled with strange beauties and stranger perils. Here the history of man will write itself anew—here the great secret of life itself will be unrolled.*

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*He seized the reporter,  
shook him like a rat.*

# THE OTHER

by HOWARD W. GRAHAM, Ph. D.

*Illustrated by Elliot Dold*

**B**ASIL SASH was a feature writer on the *Metropolitan* and a damned good one. He knew that he was on the trail of something hot. As he skipped up the steps of Captain Björn Ingvaldssen's Manhattan residence that morning he had no doubt that he was going to cash in on a

feature second to none. That was saying a great deal.

He jabbed the bell. He gave the knocker a boost for good measure and was pretty cocky about it. Then he yawned and blinked his eyes dopedly, for it was morning, and Basil Sash's nights generally reeled. Sash was dead

sober and wide-awake all the same.

The door opened like a shutter. The man who confronted him was exactly the man Sash was looking for, but Sash was sleepily nonplused. It was the explorer and scientist himself. He eyed the reporter with such fishy, icy fury that Sash was speechless. Ingvaldsen stood six feet two and carried the brawn that goes with it; he had something decidedly beefy in his appearance.

"Captain Ingvaldsen?" inquired Sash at last. He was uncommonly polite and even raised his hat.

"What the devil do you want, mister?" barked the captain.

"Let's have the story on that stiff, captain," he suggested. He adopted his easiest, most persuasive and placating manner. Sash had a lot of English on the ball. He had handled some pretty knotty customers. "You know, captain, that swell little cadaver you've got in the ice box."

Ingvaldsen slammed the door violently with volcanic dispatch. This door was massive. The architect had used up four hundred and fifty pounds of logwood when it was hung, but it clapped very briskly indeed. Sash had scarcely time enough to blink and open his mouth. Then the door banged in again just as quickly as it had shut. A hand shot out, grasped him fiercely by the throat, yanked him inside.

He swung his feet helplessly in the air. He plucked at an enormous hand which he found collaring his throat more and more tightly. Ingvaldsen had him off the floor and pinned to the door like one of his damned trophies. Sash's eyes bulged and darkened with blood:

All at once the elephantine Ingvaldsen changed his mind. He gave the reporter a violent shake that came near disarticulating the vertebrae and dropped him.

"For a minute," Sash choked out, "I thought you were going to throttle me. Now, was that nice?"

"I was!" exploded the captain grimly. He rocked on his heels, keeping his hands behind his back. "That's just what I planned to do, but I felt that perhaps some one might know you had come here, had seen you enter. Murder is a serious thing when there are witnesses, but it is all meddlers deserve."

The reporter shivered. The "Norski Cow," the name by which Ingvaldsen was known back of the city desk, had changed a lot since his last expedition. Whence this ferocity?

"Let's skip it, captain," Sash essayed a sickly grin. "All I want is the feature. The story about that lady corpse you've been keeping on ice. Give it to Basil Sash and we'll be buddies all over again."

The Norwegian's eyes narrowed. He seemed to be thinking about mayhem.

"Maybe," he said at last, to Sash's relief.

He jerked his head, indicating that the reporter should follow him. Sash trailed the big fellow into a long work chamber opening off the hall, a room packed with an explorer's impedimenta and trophies. Skins and small beasts mounted as in life. A great deal of stuff was still crated as it had come from the ship, the *Petrel*.

The two men went through into a spacious back room, a laboratory in the proper sense. Here Ingvaldsen folded hairy, bear's arms on his chest and stared at the reporter without speaking. Sash's eyes flickered craftily from the captain's ominous face to an object near the back wall. He got a full view of that which he had only pecked at as it was trucked off from the pier the day before.

That peck had been enough, enough to tell him that the captain had been up to something. While Ingvaldsen turned off a handful of reporters with its stock, technical report, Sash had been peering through a rent in a tarpaulin-wrapped

block which a crane was planting on a waiting motor van. Something that had come on the *Petrel* from the high latitudes, via Stockholm! Here it was.

"Sweet Heaven!" gasped the reporter.

THE THING really was a body, and it was a queer one. It was the body of a woman, sealed in some special kind of refrigerator. It was sheathed in an icicle, a watery stalagmite. Some specimen!

Björn Ingvaldssen, Sc. D. by his own simple choice, stood well up in the services of the American Technological Survey and had gone to the arctic with an elaborate machine fabricated by his sponsors. He had explored polar territories previously under his own government and was acquainted with the field.

The machinery he took along was one of seven outfits being tested in various quarters of the globe by other men, all field workers in the survey. The problem confronting these men was to set up the apparatus entrusted to them in certain strategic places, notably mountain peaks and other high altitudes, in order to check on the mysterious and elusive cosmic-ray drift at various latitudes. It was a mechanical problem with vast implications.

The field workers, however, had merely to operate their sensitive instruments a given length of time, seal them, return them intact to the survey to be clocked and compared. Ingvaldssen drew the polar territory. He was the most reliable man available for what was considered the most hazardous piece of work. The polar-gray vortex, too, was of the utmost importance in the survey's calculations. The captain had got some queer facts of ray distortion—cosmic bends, as it were—down on his recorders.

He did his job thoroughly with characteristic precision and shipped all his instruments to his sponsors. But he had brought something else back with him

from the arctic wastes. Distance and seasonal hazards alone were not what made him the last man in. He anchored the *Petrel* in at Stockholm first, ostensibly for repairs. There was nothing in his reports about the real reason for delay—this precious cake of ice.

When the *Petrel* nosed at last into the North River, the only newsy information the Norwegian had to give out was the fact that he had picked up the frozen rear quarters of what was supposed to be a mastodon, preserved in an arctic glacier. His men had eaten some of it.

Sash crossed to the refrigerator. This was a plate-glass box, specially constructed so as to accommodate the body within to the best advantage. A drain at the lower side of the case conducted melted ice into a small reservoir. The case stood on a pedestal or dais and could be viewed from all four sides.

Refrigerating machinery was inclosed in the pedestal and more of it spilled out, connected by cables to a mass of apparatus at one side. Dials and gauges were piped up from the pedestal alongside the glass, and more of them stood in nests on the control machinery.

Nothing else in the laboratory really mattered—the usual stock of jars and retorts, a few electrical devices. Sash had seen many shops like it. But the refrigerator! He had a story here worth a whole front page, and it would have his name on it. Boy, what a feature! By Sash.

He circled the refrigerator. The girl inside was five feet nine or ten in height and not a type he had ever seen before. She was of no known race. Her hair was molten bronze, her skin reddish, coppery. Her eyes were open. They were sidelong, but not Mongoloid, and sooty green in color. Her lips, a natural scarlet, were parted in derision, and on her face was an expression of the most ferocious cruelty. She stood at half turn, her right arm partly raised. In her

hand was a thing like a steel cigar, a metal plug with fluted sides and a button on the end.

She wore a fabulously wrought ring with a white stone on her left middle finger. Her finger nails, winking as though they had life, had dirt under the tips. That interested Sash.

But what filled him with consternation was the insolence and arrogance that went with her beauty. Even when dead she had the assurance of some immeasurable power. This was no garden variety of beauty he was looking at. She was superior to anything one might imagine on earth, any type of any race, ancient or modern. She was a thing exalted, a creation of unimaginable splendor. And she was frozen stiff.

Sash was crouching, candidly gloating on the inaccessible contours of her naked thighs, when Ingvaldssen jerked him to his feet by the coat collar. Sash faced the explorer and scientist, surprised. The man's eyes were beated and frantic. He seized the reporter by the lapels and began shaking him helpless, shook him until his teeth chattered and his sight blurred.

"You don't have to look at her like that!" shouted the captain. He bared his teeth. "She does not concern you! Who found her, eh? Answer me that! I did! She belongs to me!"

SASH WAS afraid the man was going mad. In the opinion of the reporter, a stiff was a stiff, even if it was a woman, and even if the woman was as unspeakably beautiful as this one. Captain Ingvaldssen brought his face close to Sash's. He began to rage. Sash thought he would choke on the explorer's heavy breath.

He snarled in self-defense and struck out futilely at Ingvaldssen's heavy face. He kicked. Sash was no coward, but he wasn't strong enough. Ingvaldssen's jaws bulged till they looked like ripe apples. His lips flattened, hardened. He

shook Sash still more angrily.

"You know where I found her, eh? I'll tell you, you land rat. An old Eskimo showed me the place. I gave him three boxes of cigars. I bought that girl for three boxes of cigars!"

He gave a bellow of satisfaction and jammed the reporter into a chair, dazed. Ingvaldssen stood back, still threatening. He was calmer, but his eyes glittered as though they had been crystallized.

"She was ten feet deep in the side of a glacier, an ice pack that had slipped all the way down to the sea from the pole; maybe. Who knows? We took three kayaks, and Waller and I chopped her out with hatchets."

James Waller, thought Sash. And where was James Waller now? Waller had been Ingvaldssen's chief assistant, the man who had been lost overboard in a North Atlantic storm on the return trip from Stockholm. Ingvaldssen's voice deepened to a rasping whisper. The somber, brutal passion in it shocked Sash.

"Have you ever seen anything so beautiful?" muttered the explorer. He glared as though he had lost his reason.

"She's clever-looking, all right," admitted Sash shakily, "for an Eskimo."

"Eskimo!" yelled Ingvaldssen. "Do you think I would trouble with a damn Eskimo? No! My friend," he went on in a low, intense voice, "she is not an Eskimo. She is not Asiatic, not Mongolian at all. Let me tell you something. Waller was a geologist, and he was much better at it than I am. He was a very clever man, but meddlesome. That girl is not a hundred years old, nor three hundred. My friend, Waller told me that this girl whom we found incased in ice in that terrible polar desert was thirty or forty thousand years old. That is a fact. There were no such regal types on earth then. There aren't now, for that matter. Don't you know



anything at all about anthropology, you blind fool? Look at the shape of her head!"

"Guff! You're nuts, Ingvaldsen!" Sash felt like arguing. One might find things out that way. "How would Waller know?"

"I will not give you a technical lecture," Ingvaldsen snorted. "Even I could tell that after examining the terrain. That glacier came down from the roof of the world, the immemorial ice-caps. Even I could tell that. If she is not as old as Waller said, then all the scientific teachings in the world are poppycock. They are nuts, as you say. Good Heaven, man! Look at her closely—do you sit there and tell me a creature like that was ever born on earth?"

Sash got out of the chair sidewise. He backed capily to the refrigerator. The old duffer meant well, apparently, but his invitations were two-edged. He looked again, furtively. Not of earth? It was hard to believe, when he could hear the sound of motor traffic outside the window and see ugly façades and ordinary people walking outside.

The girl was dressed in leather shorts. Tawny leather sustained with a needlessly broad, sturdy belt, the buckle of which was jeweled. She was a museum piece. She belonged in the big building in the park. He noted small items—the socket or holster in the belt, the loose jacket of scaled leather, the like of which no one had ever seen before.

He noticed that her forefingers were as long as the middle finger, and that the thumbs were twice the average length, nearly as long as any finger on her hands—shapely hands, though some might call them deformed. Her leather garb was blown hard against her as though by wind, revealing the contours of her body. Her inescapable perfection disturbed Sash enormously, and he could see how Ingvaldsen had been affected to the point of insanity. It would take a rare vision like this to wreck the

great Norwegian's equilibrium. That rock-visaged, incorruptible misogynist!

"Maybe you would like to know something," Ingvaldsen rumbled. "I said she is not earthborn, and that must be so. That means I believe, of course, that other planets are inhabited. It is possible, probable, even. Maybe you can do a feature on it later, Mr. Sash, on this: if men are going to explore outer space personally in some kind of ship, they have got to take into account the cosmic rays which we have been measuring. The drift. Direction is everything. Later I will give you specifications of the machine which must be built.

"The ray drift is a constant and is also the source of necessary power. Of inexhaustible power. When it is trapped we can forget about gravity. I will tell you about sensitized plates which will absorb ray particles, a battery which no one has dreamed of. Ha, ha, Sash, no one can get off the earth in a rocket without bursting himself open! I know a good man who is going to kill himself trying, and I am going to let him do it because he would not listen to me.

"Yesterday I told you boys that the ray drift bends to the pole. The region above the pole is a cosmic funnel, a vortex of power, and I can tap it. I have already made a model. At the pole is where any space ship has got to start. Some day there will be an airport at the pole. It is the only possible place to take off because of the direction of the ray drift, and it is the only place any one can land. I think that girl's people knew all this. She used the drift to get here, and she had to land at the pole. Maybe I am crazy, but I don't think so."

TRUE, she was not of earth, save only in form. She was an exotic, not mundane in the slightest. Sash lost himself for a moment in hypnotized speculation. She had traveled out of

some crypt of antiquity into to-day, by accident. Come from where, and how? Maybe Ingvaldssen had found the answer. Sash wished he could hear this girl's voice and what she had to say. A voice from time's dawn. She was dead."

Her pose indicated something elusive. It interested Sash profoundly. She had been raising her arm when something attracted her scorn. What was it? He gave it up and looked at Ingvaldssen.

"O. K., captain." He grinned. "She doesn't belong on this little old green apple at all. If you found her at the pole, she must have come from somewhere to get there, what? Well? What are you going to do with this—this Other?"

"I am going to bring her back to life, make her tell us what happened. And about herself." Ingvaldssen's eyes glinted. "And I am going to marry her. If you laugh, my friend, I am going to kill you now with my hands."

Sash had been thinking about ways of buzzing Jennings, the staff photographer. Photographs! He had to have them, and he cursed himself for not carrying a camera, though that was not his job. He had to get to a phone. And he wanted to get at his own end of this incomparable feature. By Basil Sash. He swallowed Ingvaldssen's bait, though. He did not laugh, but blinked incredulously.

"Why, she's dead, captain, dead as a cold-storage egg! What kind of guff are you handing me?"

Ingvaldssen walked over to his refrigerating machinery and moved the pointer of a dial a fraction of a degree with his thumb nail. Sash was aware that the ice sheath was gradually diminishing, melting away from the corpse. Certainly it was a corpse—forty thousand years dead. The Norsk Cow's mind was affected by the arctic cold.

Ingvaldssen turned slowly and said with enormous precision: "I swore Wal-

ler to secrecy, and we got this Other aboard the *Petrel* by ourselves. No one in the crew suspected. I told Waller what I was going to do, and why I should succeed. My friend, after I had got my apparatus assembled, he was convinced that I was going to be successful, and he wanted to steal her. He was a very meddlesome man and a passionate one. He wanted to buy her.

"He was crazy to promise me anything I would listen to. I would not listen. Then I could see he was going to kill me, so I murdered him. I took the knife away from him and strangled him with my bare hands. It was at night, on the bridge. Then I threw him overboard. Do you see? Nothing is going to stand in my way. People do not necessarily die from cold. I am going to prove it. Maybe you would like to stay and see it done."

"Ing, old boy," Sash grinned, "you couldn't throw me out now."

"If I do not succeed," Ingvaldssen promised, "you will get a picture. Maybe you get one, anyhow, and the story. But hands off of her! You had better keep your lips shut about Waller. It was his fault. I am going to succeed. What I set out to do, I do. Once I thought no woman was good enough for me. Isn't it a crazy thing? Now I want this Other."

"The Other." Sash remained in his chair and examined her at a respectable distance while Ingvaldssen did business in an adjoining room. There were sounds of kitchen utensils, the crackle of frying. Ingvaldssen came back with a piece of leather which he dropped in Sash's lap. It was a yard square and close to an inch in thickness, like a rug, very heavy, but soft and pliable at the same time. Sash fingered it.

"From the mastodon's rump," said Ingvaldssen with a frosty smile. "That story was true, and one of the crew tanned it for me. Very shortly we are going to have lunch—rump steak from

the same animal. It is still good to eat." He scratched his head, perplexed. "I cannot understand what happened to the front quarters of that animal, nor how it happened to be there in the first place. It was cut in two, literally broken in half. We found the right front foot."

THE TWO MEN ate generous portions of the meat. It was well-cooked, but remained somewhat tough. What it lacked in texture, however, it made up for in its succulent, gamy flavor. Ingvaldsen talked about his refrigerating plant while he picked shreds of meat fiber from his teeth with his finger nails.

The scientist was an ox of a man with long blunt fingers, but he was as high-strung as a humming bird all the same. Having had a sample of Ingvaldsen's anger, Sash wondered just what the Norsk Cow would be like if he chanced to run amok. The explorer was as much beast as man, a drinker of blood by choice and addicted to a meat diet. A dog with a hungry, restless brain. The refrigerator, it seemed, was no inconsiderable achievement.

"Chiefly I am an engineer," said Ingvaldsen modestly. "I stood in at Stockholm because I knew this Other would not keep on the ocean voyage. She would spoil the way some of the mastodon did. I have friends there who furnish me with materials. Every day I poured water on the cake of ice the girl was in to keep up the size of the block. Because no matter how cold it is, ice evaporates. In the meantime I was inventing a refrigerator."

"Sash, my boy, you would not realize how difficult it was, that ice box. Do you see why? The ice would still melt. I didn't dare to expose an inch of that girl's skin. How do I know what the world was like when she came into it? Maybe there are other factors than evolution which created present animal forms. I put it badly. Perhaps

it is something in the air, which would be part of evolution. If she was constituted to endure conditions then, maybe conditions to-day are worse for her, however we may think. Exposure to the air might definitely kill her, rot her before I had my way."

"But she didn't survive, Ing," Sash pointed out. "She's frozen. I say she's dead. All I want is to see the proof of it and get my feature. I've got to hold down my job, you know."

Ingvaldsen paid no attention.

"What if her nervous system is different," he pondered, "and she froze like this without feeling anything? That would explain a great deal. Anyhow, I was not taking chances. This ice box not only had to have elaborate temperature control, but a system of sprayers to keep the size of the ice cake constant. I had to insure the formation of ice on all sides of the block."

"Look at them. Those crossbars at the bottom of the case travel up the sides. They contain a solution of water and a volatile salt at two degrees below zero, centigrade. When the sprayers are working, the salt volatilizes, passes off through the ventilator, and only the water strikes the ice cake. It freezes at once. It would be a simple matter to fill the refrigerator with ice and burst it in three minutes."

"But there's scarcely any ice on the girl's body at all."

"I don't need ice any more. I am trying to revive her, this Other. The de-refrigerating element has been working at slow speed since yesterday morning when I landed, and the temperature inside the case is now close to one degree above zero. Pretty soon we shall see."

A chip of ice fell from the girl's body now and then. Sash could hear the small sounds issuing through the ventilator of the case. It was rather eerie. He had no real faith whatever in Ingvaldsen's experiment, then. He was ready to go down on record believing

explorers, as well as artists, writers—even including Basil Sash—were dotty. A curved shell of ice slipped from the Other's shoulder and shattered delicately at her feet. The reservoir on the side of the case was filled. There was no longer any ice in the case save on the girl's leather garments and in the fist that held the metal instrument.

The shadowed green eyes were clear now, the face moist. The girl's expression was intensified. She must have been a person of naive, if high, intelligence. She had seen something that aroused her contempt. Her expression was scornful. Sash wondered again what she had been looking at and wondered what that thing in her hand could be. He noticed that her gaze was fixed on the back of Ingvaldsen's head.

So suddenly that Sash jumped a little, Ingvaldsen rose and returned the dial on the case to zero. His circulation motor whined under the pedestal. He stood facing the Other. The ice had melted down evenly, planting the girl on her feet on an even balance. That was lucky, thought Sash. If she had fallen she might have crashed through the glass wall.

"Lose your nerve?" he asked.

"Of course not!" snapped Ingvaldsen. "Remember, she is still all ice. The temperature of her skin is zero. She is colder than that inside. Being a newspaper fellow, you should have some odd bits of information. Do you know what happens to flesh that has been frozen and then is warmed?"

"I know that it is fatal."

"But you surely know what is done to bring back circulation to a frozen member? For example, if you were to freeze a hand or an ear?"

"Oh, yes. Rub it with snow. Warm it gradually, in other words."

"That is correct. You suggest that ice plays the fine system of blood vessels in the body, literally. Capillaries burst. It does something like that. You

know, water expands when it freezes. It is one of the few substances that does. The water in a man's body wrecks him accordingly as his temperature is raised or lowered. Water is a great catalytic agent in the life chemistry.

"I have not lost my nerve. I am waiting until temperature is equalized throughout the refrigerator, till the temperature of the girl's flesh is zero. Then you will see something. She has to be brought just to the verge of melting, do you see? I think I have been given what you would call a lucky break. I will oxygenize her with my outfit here, otherwise. But do you notice anything especially peculiar about this Other?"

"She is a damned lovely kid, and then she has a gadget in her hand that she was going to do something with."

"You don't see the point at all. Look at her breast. It is expanded fully. You can see the conformation of her ribs. How beautifully muscled she is! She is as handsome as a wild cat."

Sash thought that was a fly remark. "What difference does her breast make? Its expansion, I mean?"

"You will see," said Ingvaldsen irritably. "But you should have some imagination. I want your opinion. What is she so scornful about?"

"She saw something, naturally. If you really want the opinion of a city columnist, I should say it was something big, but that where she comes from they aren't afraid of size alone. Maybe she saw that mastodon, or weren't they running around at that time? Maybe she did hop in from another planet, and she got the notion the earth wasn't worth a barrel of apples.

"Look here, Ingvaldsen, don't you think it's mighty odd that a corpse should have any expression on its face at all? They don't, do they, unless they've been drugged?"

"You're smarter than I thought, Sash," granted Ingvaldsen. "I've been thinking. She was frozen just like

that!" He snapped his fingers briskly. "It was quick, and it kept the expression on her face. The cold must have fallen instantly. That's my lucky break number two. It gives me a chance, a much better chance than if it had happened slowly."

BASIL SASH had scarcely removed his eyes from the Other in the glass case all this while. There was something magical in the mere appearance of the girl, something that got you a swift one in the ribs. He did not know what chasm this divine girl had bridged by accident, but he was getting the creeps. He had a terrible feeling that something disastrous was about to happen.

Ingvaldsen spoke, consulting a watch. "I should say the temperature of her flesh was at zero all through. Now!" He pulled a small double switch that regulated an electric timing device. This device advanced the needle of the temperature gauge by infinitely slow degrees, not a full degree an hour. "You are going to see something happen, my friend."

"Listen, captain," said Sash hurriedly. "Did you ever read a magazine called *Astounding Stories*? No? I wish you had! Listen! I'm afraid of that gadget she has in her paw-paw!"

"Paw-paw?"

"Hand. Listen. I read a story in this magazine about a gun that uses a ray, a gadget just like that one she has. What if it should go off when she melts and blow us both to hell? I wouldn't like that!"

"A gun? How could it be a gun when this Other has been in the ice forty thousand years? Are you crazy? It looks solid, doesn't it? More likely it is a tool of some kind which she keeps in that socket in her belt."

"Ing, I tell you I'm scared! I don't like this a little bit! This gun I read about used atoms instead of bullets and powder. Atomic Disintegration. It cut

a hole in three-inch-alloy steel like paper, and the gun wasn't any bigger than that. Anyhow, I don't like the look on her face. She's up to something even if she is stiff. Remember now, I warned you. If you get hurt, I'll swear on a million Bibles that you kept me here against my will, and you can't back out of it. You kidnaped me."

"Can that be possible?" wondered Ingvaldsen reluctantly. "I never saw a gun shaped like that!"

He frowned stolidly and closed another switch. The temperature-needle swung to forty degrees, somewhat above blood heat, and stayed there. This action of the scientist's was quite deliberate, and it solved a number of problems with one stroke.

Against what followed, Sash recollected several major points. Chief among these was the fact that the Other had been arrested in some mysterious action. One day forty thousand years ago the temperature had fallen deep and suddenly, stopping her hand half raised. Then, in his heart, Sash knew that the Other really had come from some place outside the earth, some alien planet in the sky, by some unknown means. This explanation offered itself most readily since no other logic would serve.

Also, and this was something he had not dared mention to Ingvaldsen, the Other was a mighty superior being, taken at face value alone. Sash had one brief moment to wonder about her antecedents, some age-old tradition of beauty and culture from which she had sprung, a superior race of another world. It was not impossible. He had read stories of such things and half believed them. If all this was true, that she had indeed come from far abroad in space, if the singing beauty, the thrilling and somewhat terrible intelligence apparent in her face, was to live again, then Ingvaldsen was something like a stupid ox for supposing he could marry her. Marry the earth to the

stars! Basil Sash wanted to get out of there in a hurry. The fact that Ingvaldsen had brought back any creature at all in the ice was a feature in itself. It had heaps of human interest. He jumped up.

The Other's hand trembled. Sash hesitated, thunderstruck. He saw her abnormally long thumb tighten on the metal tool she held. Her lungs collapsed with an audible gust; she folded forward, caught her balance again. Then she looked at both men glancingly with a kind of bitter amusement.

Perhaps her flesh was more resistant than ours, resistant to the fate of death by freezing. At any rate, Ingvaldsen's hope was clear now. In collapsing, the lungs stimulated the heart, which beat heavily once with such force as to raise purple veins in her broad, coppery forehead. Her little breasts rose and fell with her quick breathing. If she had seen something that she was derisive of when the world was much younger, what she saw of earth now deepened her expression tenfold. A small line appeared between her brows, and her fine lips curled. Her hand rose and something came from it, a blinding cone.

"Ah!" roared Ingvaldsen. He opened his arms. "Ah, my love! Come to me! Co—" !

Ingvaldsen disappeared. That is, nothing was left of his heroic body from the thighs upward. His stump banged

on the floor and finger tips dropped from mid-air. Once the Other had started to do something. Shocked terrifically by the irony of the thing, Sash realized that the Other had simply completed the movement she had begun forty thousand years ago, this time with a new target.

Suddenly Sash knew what had happened to the mastodonic remains of the beast Ingvaldsen found. The girl had shot and obliterated half of it.

A hole appeared in the glass in front of the girl's hand. Sash turned mechanically and saw that Ingvaldsen had vanished save for the terrible relics on the floor. The cone projecting from the girl's gun had knocked out a piece of the front chamber big enough to walk through. Sash caught a glimpse of traffic on Fifth Avenue, and the start of a colossal uproar across the street where the gun had wrought vast and incomprehensible destruction. He saw a shelving, curved swath cut into the earth for the distance of a mile and a quarter and saw the boiling waters of the Hudson leap into the end of it.

Then Sash turned and shrieked, his face contorted beyond human likeness. He clawed himself, gouged his eyes as though he could not bear to look quietly in the girl's time-forgotten, fresh face. He heard an agonizing sound. It was the fluid tinkle of the Other's disdainful silver laughter.



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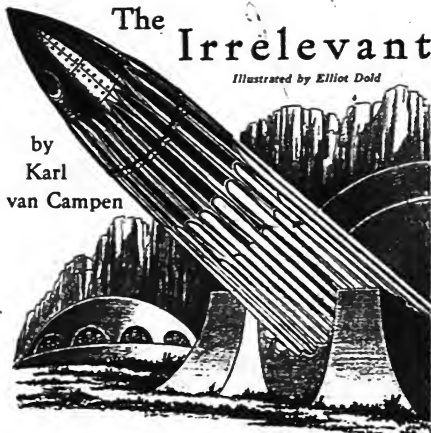
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# VICKS VA-TRO-NOL

# The Irrelevant

*Illustrated by Elliot Dold*

by  
Karl  
van Campen



*A story that disproves the  
law of conservation of energy*

KENT BARRET looked down from the port of the metal hull with a strangely tense, yet calm, smile. Not above a score of people were below, on the concrete starting surface. Three of his engineers, a lawyer, a protesting elderly gentleman, a heavy, uncomfortable-looking deputy sheriff, and half a dozen ironically grinning news men. There was a steadily grinding news camera catching the absurd scene, while the cameraman looked on smiling.

"But, Mr. Barret," snapped the elderly gentleman in an outraged voice,

"do you realize that you will be held in contempt of court—contempt of court, mind you, is an offense for which you will be jailed—if you disobey this injunction and attempt to fly that ship?"

Barret's deep, pleasant voice answered pleasantly: "I'm sorry Mr. Gethry, but you, too, must remember that I have worked for this moment for nearly thirty years. I fully intend to sail out into space——"

"But," Gethry interrupted angrily, "it is sheer suicide! You yourself have admitted that it is insanely suicidal!"

"No," replied Barret, smiling; "not 'insanely suicidal'—merely suicidal. Admittedly, I can't come back. There is a difference, however, between an insanely suicidal venture and one that is merely 'suicidal.'" Barret's pleasant smile widened as he glanced at the grinning news men. "And this venture is merely suicidal.

"You see, you are in a rather peculiar position. You, and your Protect-a-life Society, have obtained an injunction halting me on penalty of contempt of court, but you can do nothing legally till I am in contempt of court, and I shall not be till I sail. When I have sailed, I am then in contempt of court, and you can do something legally—but, really, you'll find it exceedingly difficult to do anything practical.

"I happen to represent a sort of irresistible force. That force is mankind's determination to reach other planets. Unfortunately, man was born on the wrong planet—Earth, and when the universe was designed it was so arranged that the energy of combustion of hydrogen and oxygen should be such, per pound, as would barely lift one pound of the mixture to the Moon.

"By means of this large and expensive device I shall presently find myself penniless—but marooned on the Moon, and, frankly, quite unable to get back. There is a certain number of foot pounds of work required to lift a body through the two hundred and some odd thousands of miles of space to the point where Earth's gravity and Moon's gravity cancel each other, and a certain additional number of foot pounds of energy required to lower a body from that point to the surface of the Moon.

"Now it just so happens that that number is almost exactly equal to the energy of a hydro-oxygen flame. The result is—I can barely make the trip. I shall land with about three days supply of oxygen, after a brief and flaming ride. Actually, the three days oxygen,

and the weight of the ship is moved only at the expense of being able to move not even a mile after I land."

"What possible good will it do?" snapped Gethry.

"Oh, I don't know. But it will satisfy me," Barret smiled. "Besides, landing at the extreme edge of the known section, as I intend, I shall be able to send back a great deal of highly interesting data. I hope so, at any rate. Besides, since it takes no energy to cruise in an orbit, I shall be the first man to seek the dark side of the Moon.

"Funny name for it really—it gets just as much sunlight as the other side, only because man can't see it, he calls it the dark side. Or maybe because it never gets any Earthlight. At any rate, I shall be able to make some sort of report. The broadcasting stations will be handling reports presently, I suspect, so you can listen in. I'll even send you a last, personal message to assure you that life is not always the highest value, no matter what you may insist."

"Why—it is; it must be! What can have higher value? What is anything worth if you cannot enjoy it?"

"Mr. Gethry, have you, perhaps, a son?"

"Yes—yes, I have—"

"Then you know that there is something in this quite material world that has a higher value to you than your own life."

Barret smiled again at the news men, his gray eyes twinkling. "At any rate, because the mutual affinity of hydrogen and oxygen is what it is, and because the surface acceleration due to gravity is thirty-two feet per second, and because the inverse square law applies just as well under Einsteinian laws as under Newtonian, I simply can't make a trip there and back, so I'm going to make a trip there."

"But you are young—only thirty-seven—perhaps it may be but a year



or two before some one will invent a more powerful gasoline, or whatever it is you use, that can take you both ways."

"That," replied Barret sorrowfully, "is what I devoted the first twenty-nine years of my life to; that is why in 1943 I made my first hundred thousand on acetolene fuel for the gas engine—one hundred miles in every gallon—won't you try a tankful?"

"I use it," snapped Gethry, "naturally. A man so brilliant as you are should see that his life is too valuable."

"Ah—he recommends I ask some one else to do what I'm afraid to."

"No, no!" Gethry snapped excitedly. "I don't—of course I don't! But can't you make some new and better acetolene or something?"

"Unfortunately, chemistry doesn't work that way. Acetolene is a derivative of acetylene— $C_2H_2$ —and acetylene has a negative heat of formation about equal to the heat of formation of water—in other words, acetylene breaks down to pure carbon and hydrogen and gives off as much energy as hydrogen and oxygen do when they burn.

"That would be the limiting amount of energy any such fuel could have, per pound, and unfortunately, even with this negative heat of formation, oxygen and hydrogen alone give more energy per pound. The fuel that can't be beat—I tried a tankful."

Barret's smile widened again momentarily. "For instance—even an injunction can't beat it. But the round trip from Earth to Moon and back does, I am sorry to report. There is no possibility, I am sorry to say, of finding a fuel which contains more energy per pound."

Gethry turned to the stolid deputy sheriff accompanying him. "Mr. Deputy, I demand that you stop him somehow."

The lawyer spoke up for the first time: "Sorry, Mr. Gethry, my client

claims his legal rights—the deputy cannot annoy or interfere with his business so long as he has not violated the order of the injunction."

KENT BARRET smiled once more as he ducked his head back into the metal shell to look at his instruments.

In a few seconds he looked out again. "At any rate, I'm afraid my time is about up."

There was a slow milling among the men on the ground, voices rose from a soft whisper of sound to a rustling murmur that drowned out old Forrest Gethry's complaints. Slowly, the men moved away toward the concrete structure which was to house and protect them during the flaming start.

Kent Barret watched them with his slow smile till even Gethry had been urged, protesting, into the domed, fire-proof structure. Then he turned to his instruments.

There were few, in comparison to an ordinary airplane, even. Eight simple fuel gauges, three dimensional-position indicators, an accelerometer, a barometer, and a speed indicator.

That last he caressed lovingly—it represented a half year of fruitless work, till a quite-untrained friend had made a blundering remark about "have them send you your speed by radio or something."

It was, as the friend had stated it, quite a cockeyed idea, inasmuch as the problem in the first place was to measure it, but the mere idea of radio had somehow clicked, and, characteristically, the human mind had seen the solution complete.

The result was a short-wave radio beam, housed in that domed structure, which sent a constant call on an exactly determined frequency, a wave length of only half a meter, projected as a beam.

A small set picked it up on the ship, and that set was so arranged that, as the speed of the ship increased, and the

Doppler effect lowered the apparent frequency, one element would automatically be kept in tune, while a standard oscillating crystal would maintain a fixed comparison frequency.

The difference between these would be read directly as a velocity accurate to five hundredths of a mile a second—an error of only one or two thousand miles an hour.

It was a highly important device. That, the accelerometer, and the chronometer, would regulate the flight. He was due to start in eleven and three fourths minutes now. The velocitometer was the real trick—in fact it was the mechanical brain that would take over when he started. That, and the electrothermostat.

Rapidly Barret's mind ran over the process, checking for the millionth time—his gray eyes creased and deep-set as he glanced sharply at the instruments in turn. At the take-off, the accelerometer would regulate the fuel valves to maintain an acceleration of four gravities, until the hull of the ship began to heat, and the electrothermostat cut down the acceleration.

Then as the ship rose beyond the air, to open space, the thermostat would open the valves again with the cooling of the ship, the accelerometer would have complete charge, and the acceleration of four gravities would be maintained automatically, until the velocity determined on—6.05 miles-per second—was reached.

Then the velocitometer apparatus would close the valves automatically, and the ship would dart on, weightless. And at an average speed of nearly two miles a second, about one hundred thousand seconds would be required to reach and maintain his orbit about the Moon, about a little more than a single day of his life—what a day!

WITH an exultant stretch, Barret took a last look about, glanced at the

red mark on the chronometer set in the tiny, domed, heavily braced ceiling, and cramped himself into his acceleration bunk.

It wasn't for sleeping. Kent Barret didn't intend to do any sleeping in the four brief, glorious days. Just a few tablets of anital and hang the exhaustion that followed! He'd be ultimately exhausted, anyway, by then.

Settled, his eyes on the chronometer in the roof directly before his eyes, Barret watched the hand reach the mark—and pulled the trip cord. Something buzzed angrily, like a whole nest of hornets, then the world dissolved in stars and blankness and roaring sound.

Barret was unconscious in an instant as the rocket leaped into speed and roared up on a tower of washing blue flame. He was unconscious of the awful shriek of ruptured air as the thing flung itself upward, the constant, swift-acting thrusts of the gyroscopes steadying its wobbling course against the top-heavy action of the rocket thrust solely from the rear.

But he almost regained consciousness as, for nearly a minute, it drifted up, its outer coat nearly red-hot from air friction, its rocket tubes white-hot, and shut off by the thermostat apparatus. Then he sank deeper into unconsciousness as the thrust roared out again, and the shriek of air died away, with the last fringes of Earth's blanket.

Then the roar continued very steady and very loud in the metal ship. The tiny cabin grew hot; automatic fans turned on Barret as he slept, and perspiration oozed from him. Air-conditioning apparatus that could dry the air till that of the Sahara seemed jungle-humid in comparison went into action, chemically soaking the water from the air.

Cooling was an impossibility, since any refrigerating apparatus merely pumps heat from one place to another, and in this isolated mite in space, there

was no "other place." But the man had, thanks to nature, a cooling system quite adequate.

The temperature rose in that ovenlike cabin till it reached 273 degrees Fahrenheit, a few dull explosions sounded as canned food exploded when the water inside passed the boiling point, but the man remained inert—and unharmed. The fans had cut down, to a mere slight breeze, a movement of that superheated air as thermostat devices operated.

Kent Barret was not the first man to live in an oven for a short time. For less of a bet than this, men had stood in ovens while meat was roasted beside them.

But when the eternal roar stopped suddenly, within a few minutes the man, floating now weightless in the air, sneezed violently, and awakened convulsively to find a boiling hot tomato floating in the air near him and stinging bits of hot metal and tomato on his hands and arms.

There was silence and terrific heat here now. Only the faint click of a relay here or there. Only the faint click of— Kent Barret stared at the roof. The chronometer was motionless. Slowly his eyes narrowed, the keen mind was startled and worried—without his chronometer—his only good chronometer since they were necessarily so heavy—

"I'll be damned—we tested the thing against heat—we tested it against accelerations, but like a flock of colossal blockheads we didn't test it against heat *and* acceleration!"

The heavy acceleration, the burning heat—and the film of oil, perhaps, had departed. Perhaps the temper had been drawn from the hairspring. Anyway, it was useless. Perhaps other apparatus had failed—

Barret twisted around, scooped the tomato out of his way, and with the hiss of his air rocket he maneuvered to-

ward the control board. There was a butterfly net suspended there for just such emergencies as these, and in a few seconds he had raked the dangerously hot tomatoes out of the air and thrust them in the closed garbage shoot.

Then he made an examination. With a gasp of dismay he stared at his fuel gauges. They showed, as they should, that his landing fuel was all there—the fuel which should land him on the Moon, but they showed that far more of his starting fuel remained than should.

BARRET drew himself down into his chair and slowly pulled the strap across. Thoughtfully he looked over the fuel gauges again. Something had gone very wrong. He looked at his velocitometer, and then looked again. He sighed gently.

That was what had gone wrong. It read 6.05, exactly as it should, but Barret had made too many exact calculations to be deceived. That meant a kinetic energy of such a value that, to supply it, all the energy of his fuel would have been required. There simply wasn't that much energy locked up in the amount of fuel which had been burned, so that meant that the velocitometer had gone wrong.

With a slow determination Barret reached out toward a little balsa-wood rack. Five white cylinders rested beside a bit of folded paper. With motions almost grim he took one of the five white cylinders, stuck it in his mouth, and lighted his cigarette. Cigarettes were very precious, because oxygen was. It was surprising, though, how they aided thought.

"In the first place," Barret said, half aloud, trying unsuccessfully to lean back in the weightless ship, and watching in annoyance as the cigarette smoke refused to rise, but became a growing cloud about the end of the cylinder, "I suspect I'm—er—not sunk exactly, just lost. My instruments are now quite

cockeyed; I don't know when I am, or even where.

"I can, of course, get a time signal. I might even get a velocity signal, though I haven't any proper radio apparatus. But I have been carrying a load of several tons of fuel against Earth's gravity for a long distance, and it's pulling me down. In fact, I might say it's getting me down.

"Lifting the fuel unnecessary miles, probably thousands of miles, means I won't have energy enough left to do the trick."

He puffed gently, and blew away the doughnut-shaped cloud of smoke that hung almost motionless around his cigarette. The place wasn't so hot now; it was cooling swiftly.

"Perhaps a little information would be of service."

Barret turned to his sending apparatus thoughtfully and looked then at the velocitometer.

"It must be doing something, at any rate. Maybe it would receive code."

Thoughtfully he rose and cut off a switch which disconnected the automatic velocitometer controls. Then he returned and started his own radio apparatus.

He called four times before sending a message. Then he asked them to signal with the velocitometer beam. He hadn't intended receiving messages. But now he had to. Abruptly he saw the velocitometer needle flop to the end of its run, and quiver excitedly.

Barret shook his head with slow judgment. "No," he muttered judiciously, "it won't get you anywhere to get all excited like that."

He turned to his own key.

"Don't get excited—the needle can't follow. Send about two signals a second. I suppose you asked what's wrong. The answer is that I don't know. The clock stopped. Apparently the velocitometer did, too. It says I'm making the speed, but I've got more fuel left

than I should have by a large margin.

"First, I want a time signal. My pocket watch stopped during the acceleration, but it's going again. My body kept it cool. Then, if you can slow down that jabber so that the needle doesn't get a hot box, get some instruments on me, and see what I'm doing. I can't even see Earth from this position.

"I told you that periscope rig would fold up when I went through the atmosphere, and it did. My flap valve sealed it off, though, so no damage done, except I can't see back. Old Lurda looks much the same, and Sirius is so bright I thought it was a lighthouse. Right now I want to know what to do.

"Time," flickered the needle slowly and with pomp, as though it overestimated its importance in the scheme of things, "1:48:30 when I sent the long signal—"

The needle flopped, and Barret noted it. He set his watch carefully.

"We were watching you. Seemed to cut off rockets too soon. Not more than minutes or so, though. Checking by instruments. Green Bay and Mount Wilson looking your way with small, accurate instruments."

The needle began to speed up gradually through the message. Barret grinned and turned to his own key again.

"I know how hard it is to send slow, but really, Paul, you'll melt a bearing. Tie a needle in your own circuit and judge your speed by it. When it flickers I can't read it. One way it gives me the jitters watching it; the other it gives me nothing at all."

"Sorry—observatories reporting. Say velocity neighborhood of 6.0325 miles per second. Say sorry can't be accurate as observations take time." The needle flickered in the radio laugh-signal.

"Ask them if they measured by the second rivet on the right seam or the fifth rivet on the tail guide. My blasted

instrument here says 6.1 m.p.s. minus. Can this blasted thing be right?"

"Maybe the trouble is with fuel gauges."

"No. Checked on that. Can calculations we made be wrong? Shut up. Want to work."

Barret moved sharply to his pencil and paper.

IN FIVE minutes Barret had the figures down that represented the energy needed to escape the Earth's attraction with the aid of the Moon's pull; then the energy represented by the hydrogen fuel he had carried. They were almost exactly equal, the hydro-oxygen representing a very slight margin of safety.

But the fuel gauge showed a far greater quantity. And the highly accurate observations, not merely of his own instruments, but of the observatories on Earth, showed something very remarkable. A careful calculation of kinetic energy showed quite conclusively, even when he used Einstein's relativity kinetic-energy formula, that he and his ship now possessed about twenty per cent more kinetic energy and potential energy than there had been in the fuel with which he started.

Kent Barret squinted one eye at the figures. "I have heard," he said judiciously, "that figures don't lie, but that liars figure. That makes one of us a liar. I didn't start out to create energy, nor to break the law of the conservation of energy, even if I did start out in contempt of court."

"The present situation would indicate that I am not only contemptible in the eyes of the court, but even the laws of the universe hold me so low they don't bother with me. I can scarcely conceive of a special dispensation."

Barret turned to his transmitter.

"Paul, have you done any figuring?" he asked.

The needle flickered. "Yes. Your fuel gauge is stuck, or you've broken the

law of conservation of energy."

"Find out," directed Barret, "who has charge of the enforcement of that law." A sudden understanding had come to him as he watched the flickering needle. His eyes were shining, a light of immense enjoyment was in them. "I've broken that law! And—I'm going to tell you something. Remember you wanted to know why I named this thing the *Ghost*? You objected that it was not as silent as a ghost."

"Yes—why?"

"I've got a new name for it. I called it the *Ghost* because it was unearthly—or at least intended to be. The new name is the *Irrelevant*. Look it up in a dictionary while I do some calculating, and ask the observatories to do some accurate checking. In about five minutes I'm going to burn exactly one hundred pounds of hydro-oxygen mixture."

BACK ON EARTH Paul Rilan looked blankly at the clustered news men as the message came through.

"Does anybody know the answer to that burn joke?" he asked plaintively. "Think it over while I wire the observatories."

Paul turned again to the key and pounded out a swift message to the observatories. In a few seconds an answer came back giving Barret's exact speed. The news men were clustered around a little dictionary extracted from a small bookshelf at one end of the scantily furnished office.

"Here," said Brady of the *Banner*, "irrational—that would make sense in this connection, but it's the wrong word—here it is—'irrelevant'; not relevant or opposite; impertinent." Hmm—the thing is impertinent to try that trick; it is impertinent to shatter the known laws of physics, especially the law of conservation of energy, but it isn't illuminating. What in blazes does he mean?"

"You ask him," suggested Rilan

sourly. "He never would tell me. I'm busy relaying the observatory answers, and it gives me the blue willies to key at a rate like this. I forget where I am. Shut up!"

Kent Barret read off the observatory figures carefully, and noted them down. Then he started his controls and, with the aid of his exact metering devices, fed into his rockets exactly one hundred pounds of the mixture, and listened to the contented roar of the great tubes. The temperature, which had fallen to 104½ degrees, promptly climbed to 114¾, but for some few seconds Barret had a full two Earth-gravity accelerations.

Then silence and weightlessness returned. Barret contentedly went on with his figures, with half an eye on the velocimeter needle. Presently it began to flicker. It was bringing the reports of the observatory on his increase of speed, measured with the enormous exactitude of which the great instruments were capable.

"My theory is right," Barret signaled happily. "My predictions checked with the observatory figures to the fourth decimal place. The ship is *irrelevant*."

"What do you mean by that?" demanded the needle.

Barret smiled slowly and contentedly as he reexamined his instruments. "I'll tell you when I come back!" he sent.

THE LANDING on the Moon was much easier than Barret had expected it to be, now that he knew the secret of space. And it was not hard to leave after only two days, for he had accumulated a vast amount of data. And, as he had predicted, there was quite sufficient fuel reserve now to carry him away from the Moon.

After that, of course, it was easy; not exactly for beginners, was the parachute descent he made into the Atlantic with the aid of a rather patched and scanty parachute.

"It was a fine ride, but kind of cold," he said, grinning, when the tug picked him up. "I had to leave the *irrelevant* when I was in the upper stratosphere. This suit was designed for use on the Moon, and in sunlight, where heat was more of a problem than cold, so it wasn't too warm. I fell at about seven hundred miles an hour at first, so I got through the coldest part pretty quickly, and by the time the air was thick enough to stop the parachute, it began to get warm enough to live in."

"Kent—you did get back!" Paul Rilan shook his wet hand with a tremendous gladness. "But why—where were our figures wrong? You haven't yet told me how you did it."

"Paul, we're millionaires! I have invented an engine that generates more power than it uses."

"How—how?" demanded the exasperated engineer.

"The *irrelevants*. They aren't relative. That's where we went wrong. Listen, Paul, the Earth has an enormous magnetic field—I measured it out there, you know. It's my field coil—my field magnet. All I need is an armature out there in space, an armature with great metal-wire coils cutting those lines of force and, presto, a generator!"

"You mean a space ship—carrying coils to cut the magnetic force of the Earth?"

"Certainly—there's no friction, save the magnetic resistance to use energy. We'll build it out of synthetic plastics that are almost as hard and strong as metal, but have no electrical conductivity and no magnetic resistance, so all the resistance will be in the great coils, and they'll turn it into electric power. Drive the power plant in an orbit with rockets."

"But why? Why do all that? How does the thing work?"

"A rocket," replied Barret slowly, his eyes twinkling, "isn't relevant—or, more correctly, relative. It isn't relative to

anything in its drive. You can correctly say that an automobile is going two hundred miles an hour, or that an airplane is going four hundred, but you can't correctly say that a rocket is going ten miles a second when it's in space—because it isn't. There is no absolute rest and no absolute velocity.

"Now the curious thing is, you can say that a rocket is traveling ten miles a second relative to the Earth, but with absolutely equal truth you can say that it's traveling fifty miles a second relative to Mars or Jupiter or some other planet. You have no more right to relate its velocity to Earth, once it leaves Earth's atmosphere, than to relate it to Mars.

"And here is where the law of conservation of energy piles up on the rocks. Kinetic energy is measured by the square of the velocity. When an automobile accelerates, it pushes against the Earth. If it can do one thousand foot pounds of work per second, then it's traveling ten feet a second, it pushes with a force of one hundred pounds, but when it's going one hundred feet a second, it can push with only ten pounds, because it is pushing against a surface which is rapidly retreating beneath it.

"But a rocket pushes on its own discharged gases. No matter how fast that rocket may be traveling in relation to some other object, it's always traveling at the same rate relative to its discharged gases, on which it pushes, and its reaction, or force, remains constant.

"My ship burned fuel, let's say, at the rate of ten pounds a second. It didn't make the slightest difference how fast the ship happened to be traveling in relation to something quite apart and outside, such as the Earth, the gases fed into the rocket chamber at exactly the same rate, and they burned with exactly the same energy, and they pushed with exactly the same force.

"Now comes the catch. If the ship was traveling ten feet a second relative to Earth, and the push was one thousand pounds, then those ten pounds of fuel did ten thousand foot pounds of work. But if the ship just happened to be traveling at a rate of ten miles a second, then those same gases, burning at the same rate, in the same way, did 5,280,000 foot pounds of work."

"But there isn't that much energy in ten pounds of hydrogen!" gasped Rilan.

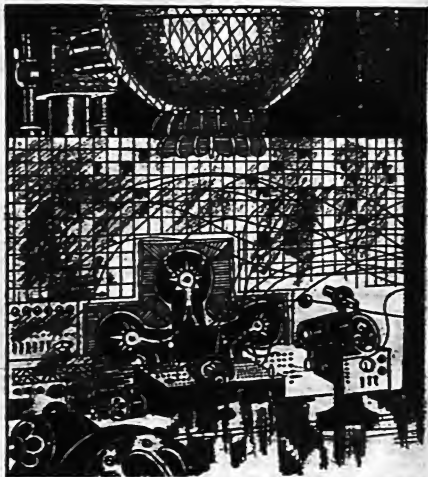
"Well, the ship was traveling fifteen thousand miles a second relative to the more distant nebulae," Barret replied, his eyes laughing, "and so at the same time, those same molecules of gas were doing work at the rate of—let's see—15,000 times 5,280 times 1,000—that's seventy-nine billion, two hundred million foot pounds of work from ten pounds of hydro-oxygen gas, am I right?"

"Ow! You're cockeyed; you must be!"

"Well, I went to the Moon and back on a supply of fuel that was very barely enough to get there. You see, if I set up those power plants, as I intend to, I shall simply take advantage of the fact that their drive is not relative to the Earth, and their generating apparatus is relative.

"It will be just as successful as a crook—the drive apparatus is a crook, working outside the laws of relativity, while the honest generating equipment is forced to stay within the law—and we collect the percentage. Jupiter would be more profitable—the higher the orbital speed, the more super-efficient the thing becomes.

"But—that's why I asked you to find out who enforces the law of conservation of energy. Until he shows up, I guess we can get away with it."



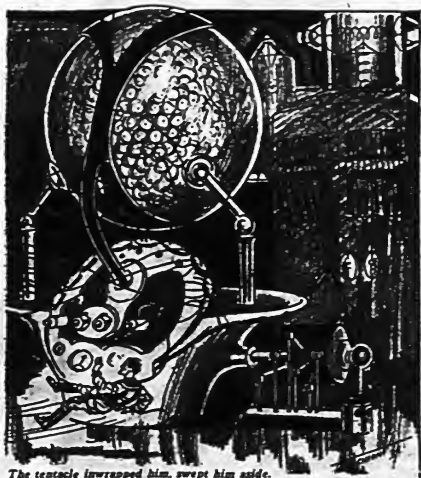
# COLOSSUS

*Valadom! World of strange beauty and supreme science and a pitiless, power-thirsty ruler—here the Earthman who became Colossus meets the Intelligence, and comes at last to the end and the beginning of all creation*

by DONALD WANDREI

*Illustrated by M. Marchioni*





*The tentacle inwrapped him, swept him aside.*

# ETERNAL

**D**UANE SHARON, formerly of Earth, gently nosed his great space cruiser, the *White Bird*, toward a glade below him in a forest of Valadom. Now that his long, tremendous Odyssey through time and space was drawing to an end, he wondered just what that end would bring, or whether it might not after all be only the beginning of some even larger ad-

venture. Yet it was hard to conceive of any vaster undertaking than the one he had carried through.

Drawing on the inexhaustible energy supplied by smashing atoms, he had traveled farther than man had ever gone before, accomplished a feat that was almost beyond imagination itself, traversed the entire universe of which Earth and its Galaxy were only part;

streaking outward at a velocity far higher than that of light, he had annihilated time as well as space; and a strange warp, an almost infinite expansion, had transformed him into a Colossus as he burst through the universe and left it only an atom behind.

He had emerged into this super-universe, in the laboratory of the Titans of Qthyalos; and, in return for his life, he had pledged himself to go to the little planet Valadom where dwelt a race like his own, to remain there a year studying it, and then to return to Qthyalos with a dead specimen of the race for analysis.

It was an odd mission; one whose full implications he had not yet grasped, so recently had he left Qthyalos; and now, as he berthed the *White Bird* near that glade where the Titans and he, through their mammoth telescope, had seen a lovely creature like the immortal dream of woman dancing in some pantheistic rapture, he wondered what his welcome would be.

Then the giant cosmo-craft, that had served him so magnificently on his lone pilgrimage through space inconceivable and time immeasurable, settled softly. And so, at last, he moved away from the gleaming controls, stepped outside into the weird forest, and breathed deeply of the curiously irradiated air—the hyperoxygen which his controls had informed him was at least pure. Then he stepped into full view of the stranger.

She stopped her lyrical motions with an unafraid suddenness, and instead of fear or curiosity or bewilderment, her eyes looked at him with a mysterious gleam as if he reminded her of some one she had known. And Duane himself, in that eerie moment, was baffled by her elusive suggestion of Anne, the Anne of long-ago who was to accompany him on his Odyssey, but who had been killed in the fierce war that ravaged Earth when they were ready to leave.

As Duane Sharon strode across the

lushly carpeted ground, he felt intoxicated with the strange beauty of the glade and the stranger beauty of the girl who faced him, and, strangest of all, the look of remembrance haunting her eyes that greeted him.

"Hello! Who are you?" he called.

It was an idle greeting. The girl couldn't possibly understand him. But he felt more at ease because he had acted as he would have upon Earth, and the sound of his voice at least gave him the confidence of something familiar. Heaven knew he needed assurance. The very sensation of walking upon the surface of an alien planet in an alien universe gave him a feeling of such overpowering awe and indescribable *difference* that he almost trembled.

The face of the girl lightened, and she smiled. She rippled a musical string of syllables that conveyed no meaning. His features must have expressed his bewilderment. A change came over her. Her eyes widened and bored into his with a piercing, compelling intensity that hypnotized him. He drew close to their inmost depths.

His vision fogged. Lines and forms danced before him, took shape. He was looking at three-dimensional objects that did not exist and seeing words whose meaning became magically clear, yet he still saw that lovely figure of timeless youth and beauty behind the specters.

He did not know what was happening. He only guessed that this girl possessed knowledge which enabled her to make her mind-pictures materialize, together with the words that identified them and the meanings that accompanied them.

"Greetings, and welcome to Valadom. Call me Shyrna."

He distinctly heard the words in her own tongue, yet also saw them as a baffling visualization and understood as readily as if they were English.

"I wish I could find some way to

make her understand me," he mused aloud.

"I do understand you, Duane. I am drawing on the essence of your mind as you are absorbing mine."

Duane tingled. He had not mentioned his name. Was he facing undreamed-of ability in this spokesman for some highly civilized race? If so, she was a friendly and blessed spokesman.

"I don't know what you are doing to me, Shyrna, but I don't much care, either. In my world, wars started and empires fell for less than you."

THE SINCERITY of his admiration brought an immediate response, a reflection of pleasure both on her features and in her mind-visualizations.

"You will learn quickly. Explanations can come later. Now it is enough for you to know that we of Valadom have minds that not only guide our physical beings, but control each tiniest part of our substance. You would call our nature electrogenetic. My mind sent out impulses until it found the exact pitch of yours. Then mine stripped the brain-cells of an electron from each atom while I spoke and projected it as a word, picture, and sound-unit for you to comprehend. It is very simple. At the same time I draw the result from your brain-cells.

"But you are weary. Drink at this pool. The waters are charged with radiation 114 and will refresh you."

Whatever "radiation 114" was, the fluid, fantastically heavy and metallic, acted like a tonic. New strength surged through him. His senses became measurably keener, fresher.

Shyrna laughed, a rich, musical sound that cafoled away. "You will get used to it, Duane. Our universe is made out of a series of hyperelements from 93 to 215 and—"

Duane stared at her. "Where is the series up to 92?"

Shyrna shrugged. "We have invented them in the laboratory, but they are of no use to us."

"But I don't see—how can I be alive at all, here?"

"Because every atom of your being underwent a change when you burst out of your universe. You left a whole system of matter that vanished even as you emerged. Your consciousness and senses you retained; your physical being was translated into our universe the moment you appeared among the Titans of Qthyalos."

Duane continued to stare at her with the eerie-feeling that he was quite mad. How could he understand so rapidly these abstract thoughts from the inhabitant of a superuniverse, even with the aid of mind-image visualizations? How did she know, how could she conceivably know, so many details of his Odyssey through time and space, his eruption from the universe of man into this stupendous superuniverse?

"Come, if you wish," she commanded. "I must return by noon."

"Perhaps I should stay by the *White Bird*."

"It will be perfectly safe where it is."

He walked beside her, as she wound her way through the strange forest. Something more than merely feeling refreshed animated him. Shyrna paused at a clearing, donned the garments she had left.

"Who are you? Why must you be somewhere at noon? How do you happen to know so much about me?" The questions flooded out of his thoughts.

Clad in a clinging iridescent stuff somewhat like an ancient chlamys or chiton, yet with a number of artfully decorative pockets for various items, Shyrna looked lovelier than ever. She strode along lithely with an easy and gliding rhythm. Occasionally she looked at Duane, and he felt increasingly the siren attraction of the golden depths in her eyes.

But whether she looked at him or not, tangible pictures danced in front of his vision. He failed in all his efforts to place them. Sometimes they seemed like heat waves shimmering just beyond his eyes, or they retreated ahead of him on the path, and at other times he simply saw them as if they were within his own mind.

"I am Shyrna—" the rest of her name was an inconceivable jumble of mathematical symbols that he missed, "and I must be back at noon in order to tell the presence of Nrm 17'1 that I am ready and all preparations are made. Then I must attend the games until night and—"

"Who is Nrm 17'1?"

"He is the race-being-entity"—whatever that was, Duane speculated wryly—"and to-morrow I become his bride."

Duane's stride broke. The calm statement was all the more devastating for its fatality. He realized instantly that he had already fallen in love with this girl, strange as she was, so physically like the women of Earth and yet so vastly different in her exotic beauty and the extraordinary range of her intellect. Now, before love ever could ripen, she was placed beyond his reach. But who was he, visitor from a dead atom-universe of the remote past, to presume on the unknown customs and people of a wholly alien civilization? He calmed his emotions with grim restraint and walked on.

"Do you look forward to to-morrow?"

"I have no choice." She looked at him again with that mysterious evocation of remembrance and welcome that had so deeply impressed him when he first saw her. "Nrm 17'1 is the race-entity. The number means that he is the 4914th in the succession of race-beings. We of Valadom are unlike past races in that each of us is an individual, but also a direct and essential part of the race-being. We could not exist

without him, nor he without us.

"When the time comes, the race-entity chooses one from the Valadomite women to bear the next race-being. It is more than a mere marriage and birth. It is a union in which every sex, every age, every person, every individual of the race, takes part directly and indirectly. I have been chosen. It is the highest honor of Valadom."

THE PICTURES presented fact, not desire, and Duane felt oddly pleased when he sensed a response to himself. With an effort, he changed the subject. "How did you know who I was? Where I came from? Did you read my mind?"

Shyrna raced away to capture a huge moth that she had spied on a bush of red spikes. The moth was daffling with all the colors of the spectrum and one that more than defied description. It beat in her cupped hands and made a sound like a plaintive murmur. Around the imprisoning hands shone curious hazes, like moth-dreams.

Duane felt a prickling of his scalp. He saw images of flight, of alighting on flower and fern, of winging through the weird forest, of freedom and escape.

Shyrna smiled, uncupped her hands. The great moth circled around her, brushed her hair and forehead with its wings, before it fluttered away.

"I like to see their mind-images," she explained. "They are so quaint and primitive. The moths always become anxious, though no one ever hurts them."

"Do you mean to say it can think? Put out thought-projections like you?"

"Of course! All living things on Valadom can, in some degree. But you asked me how I knew about your universe. I found out some events by reading your mind."

Then Duane saw a machine of colossal yet delicate intricacy. He saw motes and atoms enter it, yield their secrets.

He glimpsed a being, beautiful, radiant, but implacably menacing, possessed of brain and knowledge and power almost immeasurable, watching the machine, and from the far side of it emerged a web of meanings and patterns and past events.

"Do you understand now? That is Nrm 17'1 studying the monotonous, the primary units of all energy and matter. These ultimate particles have existed since time began and are indestructible. Each carries the record of itself, of what it has been, of whither it has gone, and of all its previous relationships. Even without the machine, Nrm 17'1 could vision most of what has gone before in the universe since each cell of his own mind could be mentally sifted to yield the outlines and story of the entire past, but the machine is quicker and also works automatically so that he can concentrate on other matters.

"Any wave-length, any particle, any tiniest part of matter or energy that enters the field reveals its past history and relations. One particle alone, if given eternity, could tell the complete story of all the universe since the first second of time. Nrm 14'9 devised the principles of the machine. Nrm 14'95 built the perfected apparatus. Nrm 16'105 was the first to understand all the past in all its details.

"And since every person on Valadom is part of the race-being, and since this is among the knowledge that Nrm 17'1 has released to us, I understand, too. That is why I knew of your coming. I have seen you build your *White Bird*; I have seen Anne; I know how she was slain in the great war that broke out when you were ready to leave Earth, and how you set forth without her to find the mystery of the universe, and the changes that transformed you into Colossus when you erupted from your atom-universe."

"Nrm, I take it, is your ruler? A hereditary king?"

"Yes; but he is more than that. He is as real as I am, but he is also the symbol of our race, the most perfect expression of our physical and mental traits. He controls all our lives. He lives in Omnis, the palace and capital of Valadom, where all our knowledge, inventions, and historical relics are concentrated.

"Omnis is a single city-building, a monster museum, laboratory, and palace combined. It covers miles of ground, but only Nrm and his assistants are allowed there. From Omnis, Nrm rules us and guides our civilization. Since our race is both ancient and wise, Nrm's power is almost limitless, because he controls all the inventions and knowledge accumulated through millions of years."

"Then there is only one race on this planet?"

"There used to be several, but long ago they were unified into one. Even our cities were rebuilt and carefully redistributed so as to allow the maximum number of us the maximum that life can achieve on Valadom."

"It sounds like a peaceful and ideal world."

Shyrna's face took on a troubled look. "Valadom was, until now. There are rumors that Nrm 17'1 is drunk with power, and that he has some terrible plan in mind, but no one knows for sure what it is. We think it is aimed at the Titans, because they alone are superior to us.

"There are an immense number of inhabited planets here, and all kinds of races and life-forms on them, but none as far developed as we are, except the Titans. Nrm has inventions that make anything so crude as ships and voyages unnecessary. But the rumors persist that he has begun some dangerous task, and it could be aimed only at the Titans to force from them the greater knowledge that they possess."

Duane became thoughtful. "It sounds

bad. Judging from what I've already seen of Valadomite genius as exhibited in you, war would be a frightful disaster."

"With all the power that Nrm controls, pitted against all the resources of the Titans, it would be—the end."

"War!" Duane cursed bitterly. "That was what wrecked Earth in my universe and robbed me of Anne. And now here I am, plunging straight into another cockeyed mess, if I read the signs. I haven't known you long, Shyrna, but I have known you well, and whatever Nrm plans, I'm not going to let him get away with you if——"

LOOKING at Shyrna with searching eyes, the Earth-invader stopped. She was the loveliest, the wisest, the most disconcerting person he had known. And she reminded him of Anne. Did nature repeat itself? Did the cosmos, building to its unknowable destination, use the same patterns for ever higher purposes in wider cycles? Was Anne, in some mystical, or extended, or ultimate, progression of atoms and molecules, reborn in part in this enigmatic creature?

"You remind me," said Duane, "of Anne, a woman I loved once. I do not see how you could know so much about me, unless she had once been part of you, and the devil take all Nrm's machines."

There was a cryptic glow in the face of Shyrna, and her emerald hair framed it with a halo of shimmering green. Duane lost all sense of time and space and balance, forgot the fantastic forest, remembered only Anne as his heart beat exultantly out toward this ultramortal enchantress.

Into those eyes he felt himself sinking, drowning, and the feel of her shoulders was a magic tingle. Wide, wider than seas and deeper than time, glowed the golden pools in her eyes. For one timeless instant, he experienced the rav-

age of a glory he had never before imagined and would never again possess in the caress of her lips.

Into that moment was woven the remembrance of Anne, his Odyssey that cleft a universe asunder, journey's end, a superuniverse whose civilization had progressed infinitely further than had any race of Earth, and now his first hesitant yet deep-rooted and longing approach to the supernal Shyrna.

Shyrna had raised her hands to his temples, her eyes still gleaming hypnotic into his. An exquisite torment rioted through him with the epitome of dissolution and re-creation. All loves, all emotions, all raptures, all breathless desires, stormed into triumphant fullness.

Then the ecstasy passed, never to return in such multiple implications, though always to underlie his love for Shyrna.

Trembling like the moth she had cupped in her hands, he gradually realized that he was staring into her eyes. They were as mysterious as before; they shone with an even more mysterious knowledge.

Suddenly her eyes widened, looking at something behind him, and instinctively she moved to his side.

"Nrm!" she cried.

Duane whirled around. Not six feet distant stood the ruler of Valadom. He was radiant as a god, shining as with some mysterious irradiation, a splendid and beautiful figure, seven feet tall and magnificently built.

His face was stern, implacable, the face of a conqueror whose iron will overrode every obstacle. But his eyes were his most disturbing and compelling feature. They were black, lustrous wells, glowing with a profundity of knowledge and an intellectual scope that fell short only of the Titans.

They shone, too, with the fanatic gleam of that monomania which drives irresistibly toward its goal, even against the advice of reason. And in them

glimmered also something of emotion, a rebuke to Shyrna, and an antagonism to Duane, the more formidable and menacing because they were expressed with a sort of ruthless logic, as if they were a mathematical puzzle already solved.

Wordless, motionless, that impressive figure stood there, staring at them. Chills chased across Duane's scalp. How had Nrm arrived so inexplicably? How—

The ruler vanished instantly, magically.

"What——" Duane began to question.

But Shyrna cut him off. "That was only a negative-projection of Nrm. He is watching us from Omnis," she explained rapidly. "He is obviously displeased. What he will do next is impossible to guess, but he may be plotting to kill you or remove you. Whatever happens, Duane, have faith in me. For reasons that I can't explain now, I don't think Nrm will dare to destroy you, but——"

Her voice snapped in mid-sentence.

A sphere like cold fire had enveloped her. Duane flung himself at it and was repulsed by a surface as hard as metal and thrown down by a terrific shock of electricity. His dazed eyes made out Shyrna anxiously peering at him with a light of confidence that told him once and for all that his destiny was hers.

The sphere slanted off northward in a dazzling streak that disappeared in seconds, carrying Shyrna with it.

DUANE could not have lain long before the paralysis passed and he rose groggily to his feet. The challenge was flung, and he accepted it. It was now Nrm against him, with Shyrna the prize, and perhaps the fate of Valadom itself at stake. His tremendous journey through time and space, his eruption from an atom-universe into a super-universe of inconceivable magnitude,

where he himself was a Colossus beyond measurement, had indeed brought him not to the end of things, but only to the beginning of a new conflict and unpredictable adventures.

As the effects of the shock wore off, his face set grimly while he thought with the cool logic he always possessed in time of danger what was best to do. First, he must reach Shyrna. Obviously, Nrm, angered at her response to Duane, had used some unknown device to spirit her away. He had most likely transported her to his headquarters in Omnis.

Duane's next step must be to locate Omnis, then to reach it. He had no idea how much farther the weird forest extended before the outskirts of Shyrna's city, and it would be a dubious risk to go on. He might lose his way and wander till he perished. If he did reach the city, there was no telling what reception he would get, what delays he might encounter, or what traps Nrm might arrange.

For that matter, so vast was the ruler's power, judging from the sample he had seen, that he had no surety he would be safe anywhere. The shining sphere might envelop him at any moment and carry him to his doom. Or even more uncanny weapons might be hurled against him.

But if he reached the *White Bird* in safety and went ahead alone, as he had carried through alone his gigantic pilgrimage into this superuniverse, he might succeed. His previous wanderings were a labyrinth compared with the fairly simple maze he now faced. He had seen a good picture of Omnis. With the *White Bird* and its own visiscreen, he could rise above the stratosphere and travel at high enough speed to cover the surface of Valadom in a day. Actually, he might locate Omnis more quickly than if he proceeded on his way and made inquiries.

He turned, hurried back along the

trail that he and Shyrna had just followed through the forest. Without Shyrna, he felt the full impact of its eeriness. Even by daylight, its abnormal vegetation, the queer creatures, insects, and birds, their startling sounds, were disturbing. He hesitated to think of what it would be like at night.

Supposing he became lost? How would he ever find his way out? What would he do? How could he possibly defend himself from marauders? He thought he was on the right trail, but all landmarks looked alike. The serrated vast blades, the black fungi, the spiky clusters, the lacing fronds, the orchidaceous flowers that rose everywhere in immense splashes of color, the indescribable odors and colors and sounds of the forest, insidiously edged on his nerves.

A peculiar animal scuttled by. It was transparent except for the skeletal structure which emitted a faint amber radiation. It had a box-body, many feet, and no head except a gill-like mass. It turned toward him, and he had a fleeting, dreadful impression of hunger-visualizations. Then there came the image of himself, next the image of lowly things like worms, and the creature scuttled on.

Duane shivered, hurried faster. It was the age-old spell of being alone in a wilderness that harried him; a carry-over from the Earth of long-ago; or perhaps an instinctive reaction.

An insect dropped on his arm. It was a lovely thing, in its hues of green and scarlet and gold, in its small ebony shell and hair-line antennae. But in front of it gathered a haze, like the boring into skin for blood, and Duane hurled it away.

Then he saw the lowliest creature of all, a large worm, lying wearily under a fungus and trying vainly to make an indentation in the soil. It evidently would not last long even in the shade. He saw a weak shimmer by it, a sug-

gestion of burrowing into the cool ground, but the image flickered.

Impulsively, he paused, kicked out a clod of the metallic ground, and gently dropped the worm in. There was a sudden strengthening of haze, a peculiar suggestion of worm-gratitude for helping fingers. Duane felt inexplicably pleased, and disturbed.

What was happening to Shyrna? Why had Nrm as yet made no effort against him? Was the Valadomite ruler merely watching him, knowing that he could not escape or succeed, and merely postponing the blow so that it would be more crushing in better conditions? He ran on.

THE SIGHT of the pool, and then of the *White Bird*, brought relief beyond expression. Duane was breathing hard from his exertions, when the caress of his cosmo-craft's controls returned to him confidence and sureness in himself. He raised the great torpedo swiftly from the exotic forest, while his fingers played a nervous rhythm across the controls.

The ship streaked up so fast that his feet tingled. He swung her in a course as closely parallel with the web that had imprisoned Shyrna as he could remember.

No sooner had he done so than a sinister visitation occurred. The impressive figure of Nrm 17'1 appeared silently, instantly, menacing, beside him in the control room. Upon the face of the ruler was an expression of insolent scrutiny. He studied Duane, the *White Bird's* controls, its supplies, the power drive, the propelling and repelling tubes. He might have been examining a worm and its dwelling for all the emotion his face showed.

Duane felt a rage that impelled him to attack the intruder, whatever the outcome; but little though he understood of Shyrna's explanations, he realized that this was not the ruler himself, but only



an electronic projection. Then the imperturbable scrutiny ended, still with absolute silence.

Nrm stared at Duane as if calmly deciding what fate was best. Only in his eyes did he show something of emotion, something of the anger that evidently drove him as a result of the Earthman's sudden arrival and intrusion upon his plans for Shyrna. Abruptly the projection of Nrm 17'1 disappeared.

Then Duane experienced a wild and sickening surge of the *White Bird* that could never have come from its own power. Valadom spun below him and blurred out of sight. He sensed a shrieking, screaming, hurricane wind. The skies whirled into blackness. The control board blurred so that he could make nothing of it. Nausea weakened him. Outside in all directions was a lightless, absolute, and impenetrable blackness that dragged eternally for a nightmarish second.

It was like nothing Duane had ever experienced. All landmarks, perceptions, and realities faded beyond his senses. It was as if some dreadful force had temporarily flung him into another dimension where he was weightless and beyond the limitations or influence of all natural laws.

## II.

IN THE GREAT palace-laboratory-museum of Omnis, capital of Valadom and focal center of its civilization, Nrm 17'1, the quintessence of the race, faced Shyrna and visualized: "Welcome to your home and the honor of helping to produce the next ruler of Valadom."

No answer.

The ruler stood erect, proud, indomitable, assailing his queen-to-be with the full force of his will. In spite of herself, in spite of her resistance, Shyrna had to admit that Nrm made an impressive appearance. He was the epitome of war lords, the ultimate in

determination, a dynamic personality who radiated absolute confidence in his powers, his goals, and his hitherto undefeated ability to obtain what he wished. He was intoxicated with the magnitude of his successes. He was drunk with an unsatiable thirst for more power and desire for all knowledge. Even his feeling for Shyrna was secondary to his driving ambitions.

"The race-being must endure, for without it every Valadomite would perish. For thousands of lifetimes it has been so. No greater honor can be given any woman of Valadom than to be chosen mother of the next race-being."

No answer.

"Why are you hesitant? Are you piqued because I brought you here forcibly in the gravity-sphere? That was necessary in order to end your foolish affection and enable you to fulfill your destiny. Are you thinking of the Earth-invader? He was an anachronism. He should have stayed and died in his universe. It was a mere accident that he hit on the secret of traversing time, space, and matter. He is inferior to us. His brain is scarcely more than a babe's. He has nothing compared to our wisdom and power, our intellectual and cultural development."

"You must not harm Duane. Whatever you do, you cannot injure him or destroy him. The Titans of Qthyalos exacted a promise from him that must be fulfilled. He must keep that promise or the vengeance of the Titans will be turned upon us. Remember this, Nrm 17'1."

The ruler of Valadom made a gesture of irritation. "Unfortunately, you are right. That is only one more score I have against the Titans. When the time comes, I will act, and then we shall see whether the Titans can save even themselves, let alone the Earth-invader."

His menacing tone softened a trifle

as he again tried to persuade Shyrna to subject herself to his will.

"I am losing my patience. I offer you the greatest honor of Valadom, and you make no attempt to accept. Every member of the race is participating in this hour. All Valadom is focalized here. How can you expect to resist the united will of those millions?"

But resist Shyrna did, her body rigid and features set like sculpture from the terrific strain of pitting her will against the entire race. The thick shadow in the room, the interlocked obscurity that was almost solid, representing the individual and combined presence of each Valadomite, beat upon her with suffocating pressure, and beat in vain. For the racial unity was disrupted by her refusal to participate, and even Nrm was compelled to admire the extraordinary strength and courage of this woman whose mind held steadfast against superhuman pressure.

"For the last time, are you ready to accept the honor and the responsibility for which you have been prepared?"

"No," Shyrna spoke in a tone of imperturbable and unshakable determination.

"Then I cannot force you to accept. To do so would be to alter our trend toward perfection which we are nearing and further disharmonize the race-identity. On the other hand, I will not let you go, because you are the most completely integrated individual of your sex. You will remain here until you change your mind of your own volition."

"The past alone can be read, Nrm 17'1. Even you can only dimly guess at the future. The genius of your ancestors and of your own powers enabled you to predict the arrival of the Earthman and to decide that I was most fitted to help in the creation of Nrm 17'2. But not even your knowledge can compel me to accept what fate suggested should occur. Since you cannot read

the future, you cannot convince me that I am inevitably destined to be yours.

"Ever since I have known about the Earthman's single-handed quest and his epic voyage, I have been anticipating his arrival. Perhaps he does not have as much knowledge as we do, but he has the courage and the spirit that cannot be halted by any obstacle.

"I knew when I first saw him that my destiny is linked with his, not yours. Since we cannot see the future, I will follow my own wishes and do what I feel is best for me. I care more for Duane. I do not know why. What have you done with him?"

"At the present time, he is marooned in a space-bend island. I have curved space, light, energy, and consequently time, around him. In effect, he is thus nonexistent since he occupies the absolute value of negation. He will remain there until you change your mind."

"He will starve."

"How can he? Time does not exist for him. Even if it did, he would require no sustenance because he is placed beyond all physical limitations. Whether he stays in the space-bend island a day or a billion years, it will seem only a moment to him."

"I will never accept you. Why don't you release him and let us go our way? As I told you before, any other woman of Valadom would gladly accept the honor. You could have your choice for the mere asking."

"I do not want them. They are imperfect. It would require centuries to prepare another for the ceremony. I want you. Such disgraceful rebellion has never before occurred. You are a discredit to our plans."

Shyrna shrugged.

Nrm 17'1 abandoned persuasion and returned to his work.

"What are you doing?" Shyrna asked curiously.

The mingled millions of the race-projection shadow vanished and with it

the almost visible pressure. Her face suddenly looked weary from the enormous strain to which she had been subjected.

THE LORD of Valadom had transported Shyrna to the central hall, the main room, the center of control in his palace. Omnis, the capital of Valadom and the palace of the royal, hereditary line of Nrm, was a titanic edifice occupying square miles of ground in the inaccessible crater of Anth.

Thousands of centuries before, when the Valadomite race was in its infancy and when its resources were comparatively limited, the first of the royal succession had established Omnis, to which the following rulers had added. Because of its inaccessibility, Anth, the highest mountain on all Valadom had been chosen. This immense peak, soaring nearly fifteen miles above sea level, had been blasted out, reduced, and fortified.

Omnis, like a jewel in a cup, rose from the midst of the vast crater which was five miles in diameter and completely surrounded by a mile-high perpendicular wall as smooth as glass. The towers and domes, the cupolas, spires, and setbacks of Omnis made it a city-building like something seen in dreams; fantastic, bizarre, with many a gleaming instrument visible at openings and windows, and shining like ebony. It was built of abdurum, the toughest known metal, which never weakened, oxidized, corroded, or was subject to any deterioration. So far as was known, it was as close to absolute indestructibility as matter could ever be.

Among its thousands of chambers, Nrm had taken Shyrna to the central control room, a hall filled with gigantic accruals of mechanism, complex inventions, amazing intricacies of metal, tubes, plates, grids, and electrical apparatus. The room implied power. Its

mere appearance indicated that energies and forces of startling magnitude could be released in an instant.

Nrm, who had abandoned his attempts at persuasion on Shyrna, was now standing in front of a colossal sphere formed by billions of cells interwoven with mazes of wires. A myriad metallic plates served as mirrors.

"This is the Infinite Eye. It can pick up anything anywhere in our universe and also transmit the materialization of anything I choose to project. The search-beam is separable and multipliable so that I can look on many different worlds and scenes at once and direct thousands of activities in the different mirrors. I am using it to defeat the Titans of Qthyalos."

Shyrna gasped. "But you can't! They alone of all the races have greater knowledge and power than we! They could utterly annihilate us! Why, they even know every slightest detail of everything that will ever happen in the future!"

"That is exactly what I am after. Knowledge of the future is the most important problem that I have not mastered. They have learned how to see the future, but they refuse to give me the secret. Therefore I will take it by force. Knowledge! Ultimate knowledge! The answers to everything I do not yet know. I will be like a god when I have the knowledge."

"The Titans are stupid. What use have they ever made of their knowledge? Nothing that any one has observed. It has produced no wonderful new inventions or power, so far as I know. But when it falls into my hands, I shall be lord of the universe, master of all energy, all matter, all time, all space, all possible knowledge of all things and all thoughts."

"But if the Titans will not give you the secret, how can you force it from them? If they know the future, they

undoubtedly control sources of energy greater than yours."

"I am using the Infinite Eye to mobilize every race throughout our universe. As you know, there are approximately a million inhabited planets and cold suns in the Galaxies of our universe, but none of these races has progressed as far as we have, and we are second only to the Titans of Qthyalos. For the past year I have been using my Infinite Eye to speed up evolution and advance the civilization of these races so that they may be ready to aid me.

"I have raised savages to superbeings in a day. I have sent them knowledge that they would not otherwise have discovered for millions of years. I have halted wars, stopped the ravages of disease, obliterated predatory monsters and undesirable life-forms, leveled mountain ranges higher than our nearest moon. I have destroyed worlds and created worlds, deflected comets from their path, cleared vast regions in space of poisonous gas clouds, done thousands of other such trifles to unite and advance the millions of civilizations and life-forms on the inhabited planets and to make their journey quite safe."

"What journey?"

"See for yourself. Look!"

Nrm's hands played an ever-changing rhythm across the controls. A mirror glowed with activity, strange scenes sprang into momentary reproduction on other mirrors, the scenes shifted and flickered like a patchwork of thousands of different cinemas.

Shyrna stared, stared with wide and startled eyes at what she saw. From the far-flung outposts of the super-universe to its central Galaxy, every inhabited world swarmed with intensive activity and preparations. Worlds that were millions of light-years apart were brought together by the Infinite Eye and reproduced in the mirrors for Nrm to direct by remote control.

SHYRNA looked, saw, and understood as no words of Nrm could ever have convinced her. She saw with ruthless clarity what mischief he had done. She saw cruisers from the utmost planets of the outermost Galaxies already launched, gathering momentum, blasting across the eternal voids toward Qthyalos as a result of the information and directions Nrm 17'1 had sent.

There was only one ruler they recognized—Nrm 17'1 of Valadom. He had commanded, and they obeyed. When the ships from the ultimate worlds reached the next inhabited bodies, more cruisers, swarms and legions of other space ships, clouds of cosmic voyagers, would ~~die~~ to join them and sweep on.

From the far-flung immensity of space stretching in all directions to the ultimate blackness whither many explorers had penetrated but none had ever returned, the hordes of Nrm's fleet were closing in, armed with forces of their own and with power and with weapons that he had transmitted to them.

They were only thousands in number now. But Shyrna saw how other worlds were preparing to launch other attackers, how day by day, the fleet would mount by tens of thousands and then by millions and then by tens of millions as they ~~blazed~~ and bored across voids and through Galaxies toward Qthyalos.

She needed little imagination to look ahead and foresee that space would grow dark with their massing while they hurtled on, converging and thickening with a drive and a strength that all the armies since time began would not begin to equal.

Shyrna saw their armaments. They came armed with every weapon and every destructive agency ever used and many that had never before been tried.

There were blasting powders that could split worlds, explosives one grain of which could blow suns into compo-

ment atoms and scatter them over the universe. Nrm's legions had heat rays with a maximum of twenty million degrees and cold rays that concentrated the complete absence of heat, absolute zero.

Some wielded screens of invisibility and projected phantom images of themselves. Others controlled lightning in which hundreds of millions of volts would crackle in a steady arc across space wherever they aimed it. Still others were ready to liberate gases that would utterly dissolve flesh, metal, and substance of every sort in the elements below it.

The universal legion was armed with gases that paralyzed, gases that exterminated the mind-nerves only, gases of amnesia, gases that combined with blood to form instantly fatal poison compounds, gases that exploded when they seeped into animate beings, gases that were alive with a malignant life of their own and that would ravage as no gas had yet done to the best of Shyrna's knowledge.

In the hands of that terrible onslaught were diseases that had never been known on Qthyalos or Valadom, diseases contagious with the speed of light, other diseases that Nrm had invented, hyperbiological sub- and super-bacteria of uncheckable and incurable malignancy, sentient, intelligent, educated, knowing, perceiving, acting microbes organized into their own highly developed submolecular civilization, ready to attack foe and avoid friend with such infinitely infra-atomic weapons that even Nrm admitted that he could not see them and did not know what their effect would be.

The Plant-Creepers of W had discovered a poison that caused blood to vaporize. The Heads of Akkar moved buildings by mind, slew creatures by will, shook worlds by determination alone. The Radiations of Symbolon had an infra-electronic stream that built up

complex new solids and infiltrated the being of any creature it touched, changing that being to a thing of inwoven flesh, metal, vegetation, matter, and ultracomound. The Furred Folk of Thethog counteracted gravity, instantly causing every movable object to hurtle from the surface of its world. The Anthareans reversed the direction of light-rays, creating an impenetrable and ever-expanding sphere of absolute blackness until re-reversal of the rays.

There were hundreds of other weapons, countless races to wield them. Knowledge had been ransacked and science dedged for power. And added to these were those greatest weapons of all that Nrm controlled—the limitless power of the atom, the unbelievably destructive power of rays and radiations and primary wave lengths.

Shyrna felt utterly disheartened as she witnessed this stupendous concentration of power, this cosmic preparation for a battle which, if it ever began, must inevitably become the most frightful cataclysm that the folly of ambition had ever conceived. Was this to be the result of the laborious progress of Valadom? There had been no warfare within living memory. Was Nrm's egotism to destroy overnight what it had taken ages to build up? Shyrna tore her gaze from the evil scenes of the mirrors.

Nrm 17<sup>th</sup>, wrapped in his dream of conquest, consumed by the spectacle of the enormous forces that he had set in motion, scarcely saw the aversion in Shyrna's face. His eyes glowed with a fanatic fervor as he exclaimed:

"What can the Titans do against these? More than the weapons of my universal army, they have only the knowledge of the future which I shall wrest from them! They have only control of the cosmic, ultimate, energy-matter source of all things, which they dare not use. They cannot resist.

"The very presence of that myriad a

year hence, the sum and peak of all known energies directed by intelligences of the whole universe, but under the final authority of me, will force the Titans to relinquish their knowledge of the future. Not one of these weapons need be used, or will be used, if the Titans will grant me what they can so easily do."

SHYRNA looked at the radiant race-entity who would be a god with something like pity in the slow shake of her head. "More than ever, I know that I will never consent to bear the next Nrm. Power! Knowledge! I do not want them. I wish I did not know even the past, and I desire nothing of the future. Then I could be with Duane and be excited about every least thing that happened because it would all be new and strange. What will you do when you know the future as well as the past? There will be nothing further."

"What lies beyond the outer fringe of the universe is the last mystery—"

Shyrna interrupted: "I know. You've sent messengers, but they never came back. It seems obvious that nothing can return from there. You never will learn what's beyond unless you yourself go. And then your knowledge will be of no profit because you won't have any of these forces and machines, and you won't be able to return to our universe."

Nrm 17<sup>1</sup> turned irritably to his Infinite Eye and resumed directing his vast army.

Days, weeks, months, passed. Shyrna was free to roam the palace. She devoted most of her time to wandering through its several thousand rooms. Here was concentrated the culture, the arts, the learning, the history, the inventions, and machine progress of Valadom. It was the museum of the race.

In the library, she examined ancient picture books and word books and later evolutions that led to the recording of literature in pin-point electronic struc-

tures which, inserted in transcription-machines, simultaneously presented audible sounds, visual picture meanings, and visible words.

In the biological section of the palace, she studied the details of early surgeons' experiments with bioplasm and prenatal plastics which produced many freaks, such as the giants, the jellies, the bodiless brains, the winged heads, and the energy-driven creatures who were a curious link between pure mechanics and animate life, before the surgeons successfully developed the long-lived, beautiful race of which she was one.

Here were the records of wars and conquests, hatreds and loves, invasions from other planets, physical conquest of space, the slow building up through millions of years of a superrace. The story of how Nrm 1 came into being lay here, and of how each Valadomite was linked with its creation and must partake of the creation of each succeeding race-entity. How the lengthening of the life-span to ten thousand years was accomplished, she learned, and of the supervision of ever-wider power and deeper knowledge.

When Nrm 11<sup>19</sup> first began to grasp the external interrelation of basic energy-matter, she reviewed how he began the construction of devices that Nrm 14<sup>120</sup> perfected.

Then one primary unit, introduced into the machine, gave up the secret of all its past wanderings and relations, which were projected in triple translation.

She saw anew the Odyssey that told the whole history of an earlier universe's building up until millions of Galaxies each with millions of stars had been created; and how a greater universe went on building and expanding until the first was a mere lost, lifeless atom, a tiny bubble inside a huger bubble; and of how one Earthman discovered the secret of atomic power that

blasted him out of the first universe, but left him wandering in time, probably to appear in a certain part of Qthyalos at a certain time.

But the primary units told nothing definite and complete of the future. The Titans possessed something by which primary units gave not only all their past relations but all their future ones as well; but no Nrm had yet deciphered the puzzle.

Then there were the storehouses of the arts, ranging from literature and painting to those ultrakinesthetics of to-day; the extension from visual representations to intellectual and abstract arts; dancing, for instance, which evolved from choreographic motion to dancing of light and color, then of pure form and motion, then of idea and thought, and finally the dancing of mathematical patterns and pure abstractions performed by the components of energy.

But Shyrna browsed only to while time away and draw a veil over her real occupation. Duane was ever in her thoughts. Persistently, she refused the demands of Nrm 17'1. She was pursuing a single aim—to discover among all the incredible variety of machines, that filled fully half the palace, which one imprisoned Duane in the space-bend island. Nrm undoubtedly operated it by remote control or relay from the central room.

She hadn't a chance of access to it there, for Nrm or his assistants were always on guard. She had to move almost without volition or thought at times, so sensitive and aware was Nrm. In his presence, she closed her thoughts, literally ceased thinking. Only when away from him did she plan and scheme.

But her apparently casual wanderings were successful. Months of observation enabled her to find the source of the space-bend island. The projector was in room 435, where a hundred other machines of elaborate design and fantastic

purpose stood ready to perform unguessable functions or release unknown energies.

Against seemingly hopeless odds, and without the slightest assistance, Shyrna was patiently and tenaciously working toward—one of three possible goals. These were: escape; release of Duane; collapse of the onrushing universal legions.

Escape, however, she early dismissed from her mind. Omnis was so heavily fortified and situated in so inaccessible a spot that outside connivance would be essential. Disbandment of the ever-increasing fleet would be possible only by obtaining control of the Infinite Eye, a manifest impossibility.

Her sole chance, and that a slim one, appeared to be the releasing of Duane. She knew that his first step would be to come to her help. Somehow, he would win through, take her away. Then it would be up to them to speed to the Titans and enlist their aid.

And constantly, through those swift months, the army drew closer, the legions of the entire universe; the fleet, increasing by millions upon millions of space ships of every conceivable shape, power, occupant, and armament, gathering from all the inhabited worlds, and speeding at unthinkable velocity toward Qthyalos from all directions; a constricting and ever-thickening sphere of doom.

AS THE MONTHS passed, Shyrna became aware that Kalkartha, one of Nrm's assistants, was frequently near by. He was of even more magnificent physique than most of the Valadomites. He was among four who were delegated to keep an accurate check on the approaching legion.

Nrm 17'1 had quartered the universe, his assistants taking care of details while he directed the main advance, laid schemes for the attack, and created new inventions and machines. He perfected

a supermechanism that rivaled himself. It was a monster complication launched by a recent Nrm. Into it had been introduced the dead brains of each successive Nrm for sensitive monotonous "fingers" to probe. The entire substance of the living mind was extracted from the dead brain-cells so that eventually the probing beam had assimilated the entire body of available knowledge, including the whole history of the past.

Nrm 17'1 now succeeded in transforming the mammoth apparatus from a passive or inert to an active or kinetic state. In other words, it started thinking for itself at the point where Nrm 16'817 had ended. Having no passions, emotions, ambitions, or desires, such as warped even Nrm 17'1's intellectual nature, the machine went on thinking in terms of pure knowledge.

Nrm supplied it with photo-electric eyes, adjustable tentacles, materials, and power of every kind. The machine now conceived, invented, and erected machines of its own in mere hours; amused itself by solving hitherto insoluble problems; and set to work attempting to construct a device that would make the primary particles reveal their future as well as past relationships.

It was this machine, which Nrm called the Intelligence, that finally gave Shyrna her inspiration. The projector in room 435 was safeguarded so that any approach to it immediately registered with Nrm 17'1. Alone, Shyrna could never hope to release Duane. Even if Kalkartha unwittingly furthered her scheme, there was still a large chance for failure. But if she could divert Nrm's attention for a few seconds, she might succeed.

Everything depended on Nrm's distraction for the briefest time, and on his being unaware that she knew the location and mechanism of the space-bend projector. Behind all her preparations lay a restrained anxiety for Duane. What was he experiencing in his curi-

ous exile? Could she release him before the battle hour struck?

Following the first step in her plan, she casually approached the Intelligence one afternoon. It had a number of light-, sound-, and color-sensitive eyes. Some of these were lenses—telescopic, microscopic, infra-atomic, and sub-atomic; some were merely light-sensitive metal cells; but the Intelligence also possessed a pair of normal eyes, an exact replica of retina, pupil, cornea, nerves, and so on. The normal eyes, like the eyes of Valadomites, were able to project visualizations.

Shyrna walked to this pair of eyes, stood directly in front of them, stared into their metallic and impersonally watchful depths, and deliberately projected the square root of -1.

The effect was magical. The Intelligence purred with something akin to excitement. Shyrna strolled on. But the Intelligence, struck by the possibilities of the field she had opened up, went on projecting impossibles.

Nrm hurried over, studied with delighted fascination this new endeavor of his toy. The Intelligence, purring like a thing alive, visualized the final cardinal number; unscrambled the fourth dimension in a three-dimensional representation of voluted cones and spiraled cubes that tortured vision.

The Intelligence illustrated a no-dimensional existence; flung out a spectrum of contrasting colors that were identical; depicted pre-time. The Intelligence achieved the impossible, answered the unanswerable, solved the unsolvable. Its brilliant projection of impossibles magnetized Nrm 17'1. His plans were succeeding well. He let his assistants perform the nominal duty of seeing that his fleet approached on schedule. He devoted as much leisure as possible to watching the amazing Intelligence.

Next Shyrna closed her mind-images in part. It was necessary for the suc-



cess of her plans. She could not take Kalkartha into her confidence. He evidently admired her. Far as the Valadomite mind had developed, it had not been able to extinguish emotions completely.

Shyrna struck up an even closer acquaintance with Kalkartha than with the other persons in Nrm's headquarters; and, in the course of prolonged maneuvering, which required the assistance of coincidence that must occur sooner or later according to the law of chance, she one day stood beyond the safeguard around the space-bend controls, as she had done hundreds of times before during her patient waiting.

Kalkartha passed the open door, and she looked at him, deliberately putting into a visualization all the come-hitherness and love-receptiveness of which she was capable.

Kalkartha entered the room, walked toward her with delighted features. "Shyrna! I know that Nrm 17<sup>1</sup> will remove me if he is watching, but it is worth it to know that you feel for me as I feel—"

The sentence broke off. Shyrna retreated beyond the safeguard. Kalkartha reached her, and she willingly surrendered to his arms. For a few seconds, nothing happened. That meant Nrm had been watching the Intelligence when he received the warning. Then, and suddenly, Kalkartha disappeared as if he had never existed. Nrm 17<sup>1</sup> was obviously removing another rival.

Hoping he had thought it merely an accident that Kalkartha happened to approach her near the space-bend projector, Shyrna sprang to the machine. She worked madly, feverishly. Seconds ticked by. Would her ruse succeed? She found the key control, cut its power to zero.

She had only done so when the implacable negative-projection of Nrm 17<sup>1</sup> stood beside her. "Yours was an ingenious ruse to divert my attention to

Kalkartha while you liberated Duane, but it will avail you nothing. I have transported Kalkartha to the Desert of Grythg. The Magnetic Essences will take care of him. Duane will come out of the space-bend island somewhere near the same region.

"I will locate him shortly and project a mountain in front of him as soon as he is traveling at high speed. He will instinctively stop the *White Bird*, thus smashing himself against the forward wall. That is the punishment for attempting to thwart my plans. Not even you can save him now. Not even the Titans can!" he boasted balefully.

### III.

TO DUANE, suspended in a mysterious and impenetrable shroud where all his senses were thwarted, the black void and the nausea passed as swiftly and inexplicably as they came. Dazed and bewildered by these phenomena, he discovered that the *White Bird* was plunging toward a desolate, deserted wilderness where freakish vegetation sparsely raised spikes in supplication to a searing sun.

He could not detect the slightest sign of life. He had no understanding of what had happened, where he was, or how he got here. The strangeness of things that first impressed him on his arrival at Valadom was only deepened by the mystery that enshrouded this recent experience. Why had Nrm let him escape? What was the purpose of whirling him off somewhere for a few seconds when he might as easily have been slain?

He halted the fall of his cosmocruiser and leveled her at low power and altitude to survey the waste land. Where could he be?

Nrm 17<sup>1</sup> had obviously used unknown force to transport him to unknown regions. So far as Duane knew, he might have been hurled from Vala-

dom or placed upon a distant world whence he could never regain Valadom or Qdhyalos, though he searched for a lifetime. Still, the strange, absolute blackness had lasted merely for seconds. It was inconceivable that he had been hurled to another sphere in so brief a time. Probably he was crossing a desert somewhere on Valadom.

The waste land, strewn with stupendous jumbles of rock-masses and weathered ores, splotted with the oxides of ages and the detritus of erosion, stretched to all horizons. It was the dreariest landscape he had ever viewed. He saw neither bird, mammal, nor being, neither animate nor inanimate life, except the scrubby dwarf multiforms that straggled here and there.

They looked forbidding, as if, waterless, they wrenched a starved and elementary existence only from the minerals and oxides themselves. They reminded him of the results of a chemical experiment he had once made: spikes and filaments and streamers building fantastically out of silicate solutions.

He had not been cruising long when he spotted the first sign of animate life. Some distance ahead appeared a shimmering haze. In it stood a moving speck. He sent the *White Bird* arrowing swiftly to the mites. They loomed below him.

A magnificent Valadomite, powerful, beautiful like all the individuals of his race, but obviously weakened, was defending himself with a metal rod from the thrusts of hunters that ringed him in.

The attackers were as weird as anything in this weird region. Duane could barely make them out. They were transparent, almost invisible. They shimmered faintly in the reddish light. They constantly changed form. Now they were lines, then they were wisps of smoke, again they became fluctuant irradiations. They were misty, vaporous, nightmarish.

Duane went into action. Cool, now, and confident as always in the face of danger, he moved swiftly to aid the besieged Valadomite. He brought the *White Bird* to a complete stop, tilted her with her nose to the ground.

His next step required careful maneuvering. One of the Protean entities came close to the Valadomite. He touched it with his rod, and the formless thing disappeared in a dazzle like lightning. But the others crowded closer, and he pirouetted dizzily in his efforts to keep them at bay.

Duane adjusted the fore power-blasts with as much care as haste permitted, offset with the rear drive. The Valadomite was fast becoming exhausted, one against dozens of bodiless raveners. Duane unloosed the searing flame of his atom-smashing power. A circular tube of annihilation burned the creatures into eternity in flashes of incandescence.

The destroying circle came dangerously close to the Valadomite. He shrank and almost backed into the opposite wall of flame. The *White Bird* shot off into space through a slight miscalculation before Duane brought her under control and dropped her beside the Valadomite.

"Whoever you are, stranger, accept my grateful appreciation for saving me from the Magnetic Essences. No one but Nrm has ever before succeeded against them. I am Kalkartha. And you?"

"Forget it," replied Duane crisply. "I'll be damned if I'll let any one be killed by a gang-up. You don't owe me anything, but if you did, you could even it up by telling me where the heck I am. I'm Duane Sharon, of Earth."

"Earth? I know it not. This is the Desert of Gryrth, some fifteen thousand miles southwest of Oomis, the capital of Valadom. This desert is the heart of the uninhabited Red Continent where the outlawed and inimical life-forms are kept imprisoned."



*Upon the face of the ruler was an expression of insolent scrutiny. He studied Duane—and, for all the emotion he showed, he might have been studying a worm.*

"Then how the deuce did you get here?"

"I was one of Nrm's assistants and unfortunately fell in love with his nominal bride. I suppose he saw me with Shyrna, for I was suddenly transported here. I do not know by what means, but I presume either the gravity-sphere or the teleportation——"

"Shyrna? Did you say Shyrna?"

"Do you know her?"

"I should say I do. This must be the Nrm person's dumping ground for any one who makes a play for Shyrna. When were you sent here?"

"Just now. I was one of those designated to keep watch on the universal army fleet. I saw Shyrna often in the palace and fell in love with her. I knew it was hopeless, since she was dedicated to Nrm, and I concealed my feeling for nearly a year, but to-day she——"

"Did you say a year?" Duane asked, incredulous.

"To-morrow will mark the end of the first year that Shyrna has passed in the palace. All Valadom is growing restless because Shyrna thus far refuses to help to create the next Nrm. The people are demanding that she yield, or else be sent away and a new bride chosen. Did you not know this? To-morrow is also the day when the legions of space will be massed around Qthyalos to defeat the Titans."

DUANE was badly befuddled. Had a year actually elapsed during what seemed only a second of darkness? What were the legions of space? Was Kalkartha telling the truth about Shyrna? If so, would he not be letting himself in for more grief by be-friending a rival?

He dismissed his doubts as unworthy. He had saved Kalkartha, but he had no special claim on Shyrna. It was for her to decide whom she wanted.

"Climb in," Duane suggested.

Another group of the Magnetic Essences was spinning toward them.

"Where to?" asked Kalkartha.

"Omnis and Nrm, if you're willing."

Duane liked the Valadomite more and more as they sped on. Rivals they might be, but friends in adversity they already were. Under the directing guidance of Kalkartha, he lifted his cosmo-craft to ten thousand feet and stepped the speed up toward fifteen thousand miles an hour at the mid-point of flight, which, allowing for acceleration and deceleration, should bring them to Omnis in an hour and a half.

They were swiftly gathering momentum. The Red Continent and its weird denizens blurred underneath them. Without warning, a mountain magically uprose its titanic bulk straight ahead and too close to avoid except by a fatal dead stop.

Duane cursed savagely. Before instinctive reaction had time to cause his hands to move even a fraction of an inch on the controls, the dangerous mountain vanished as suddenly as it had risen. At the same time, though the Sun rode high, a singular and heavy darkness enshrouded the entire globe.

It was a strange, abnormal darkness, so complete that Duane automatically braked. He could not make out even the dimmest of outlines. Was he again under the sinister influence of Nrm? He sent out an experimental beam from his searchlight, an almost blinding cone that was a byproduct of his atom-smashing power. The beam cut clear, picked out an ellipsoid segment of the desert below.

"I don't understand this," Duane muttered. "You saw the mountain, too, but it disappeared. And now this darkness."

"The mountain was probably one of Nrm's projections intended to destroy us," Kalkartha guessed, "but I do not know why it vanished. The machine could not conceivably have broken down.

There is no power superior to Nrm's except the Titans, and there is no reason for them to interfere. The darkness is beyond me. I have never experienced anything like it."

At a greatly diminished velocity, they continued northeast. The desert crept by underneath. Barren, ravaged, desolate, it was a land lifeless except for the Magnetic Essences. It extended for thousands of miles in the same monotonous repetition of oxidized ore, silicate, lava, weathered rock, metallic powder dunes, and gulches. The mysterious darkness made close observation difficult, except under the ellipsoid glare of the searchlight.

"The towers of Abavon!" Kalkartha exclaimed. His keen eyes identified a blob outlined against the gloom ahead. "I know where we are now. We have reached the northeastern extremity of the Red Continent. Turn a little more north across the ocean and we shall be headed direct for the capital."

"Isn't it strange that Nrm has made no more efforts to get rid of us?"

"I, too, am mystified. Possibly Nrm is tricking us. The darkness may be the forerunner of some fate he is preparing for us."

Duane flew swiftly toward Omnia. He wanted above all else to reach Shyrna. After that—he had no plans. It was hardly believable that he could even reach her against the antagonism of Nrm. And if he did win through, what next?

Kalkartha had informed him of the legion of doom now almost upon Qthyalos in still-increasing force, the most potentially destructive and impregnable fleet ever mobilized. What could the outcome be?

Kalkartha's aid was essential to finding Shyrna. But Kalkartha was a rival for her hand. Nrm had already won her, nominally. And to fulfill his promise to the Titans, Duane must return to Qthyalos to-morrow. It was a multiple

dilemma. What had happened during the year of his bizarre exile, the year that had simply dropped out of his life? Would Shyrna still be waiting, if she even believed he was alive?

They crossed mountain, plain, and sea, many a lovely city, before they approached Omnia, the single vast metropolis-building set in the midst of its artificial crater completely encircled by towering mountains. Duane stared in wonder at its mile-high towers and spires; its black cupolas and abdurum set-backs made a fairy-tale palace beneath him. —

The darkness persisted.

"I am sure it is a trap," Kalkartha cautioned.

"Trap or not, I'm going to find Shyrna. If Nrm gets me—well, it's part of the game. Death without her wouldn't be much different from life without her. I'll set you down wherever you want to land."

"I go with you."

KALKARTHA guided him. He berthed the *White Bird* on the topmost roof of the palace, a flat surface like a landing field, perhaps two hundred by a hundred yards. For just a fleeting instant, so fleeting that he dismissed it as an optical illusion, Duane thought he saw the flicker of sunlight. But the strange darkness persisted.

Kalkartha swore. "Earthman, I must be losing my mind. I would take my oath that I just now saw sunlight before this damnable darkness settled again."

"Me, too," Duane agreed.

The darkness suddenly deepened to a jetty blackness. Kalkartha took out a tiny disk on a curved clamp, adjusted a mere filament of a pointer, and set it on his forehead. A cone of brilliant light flooded out.

"I swear this peculiar darkness is beyond reason," Kalkartha remarked fretfully, "but at least we have the use of the tel. It is one of Nrm's more

popular inventions. It has extremely complicated mechanism put together under subatomic microscopes. A few atoms of element 163, enough to last a lifetime, are its basis. When operation is started, an atom begins to break down, electrical potential is converted to kinetic, this to heat, and the heat to light.

"It is safe now. Some of the earlier ones were too powerful, and when released at maximum caused instant blindness to any one looking at them. Put this ring on your finger. It is a relay. It will give you a good though much weaker beam by induction."

Kalkartha picked his way to an apparently smooth section of the roof. He kept an instrument like a splayed pencil trained on the spot for several minutes.

"What are we waiting for?" Duane demanded.

"The calculator takes time to build up all possible combinations in the course of which it discovers whatever infra-atomic lock has been used—Ah!"

A square of the metal tilted up and they descended. Kalkartha threaded his way through a maze of corridors. Beyond open doors, in the light of the tel beam, Duane occasionally glimpsed bizarre machines, inconceivably involved and intricate creations of genius, other stuff that meant nothing to him, files and records and three-dimensional paintings and creepy skeletal structures; preserved specimens that covered whole evolutions of ultrabiology; exhibits of twenty-five vitamins; several hundred thousand bacteria; millions of organic compounds, countless inorganic multiples.

They turned a corner—and a hurrying Valadomite passed two feet from them.

Kalkartha instantly shut off the beam, whispered: "Stop where you are!"

The results were fantastic. Absolute

blackness descended. The stranger vanished behind its secrecy. They heard not a sound.

"What the deuce!" cried Duane. "Turn the beam on!"

It leaped forth, picked out the surprised features of the man. He shrank against the wall, his eyes roving around in apparent bewilderment.

"We won't hurt you, Blade, if you keep quiet," Kalkartha promised. "Where is Nrm?"

They saw Blade's puzzled eyes concentrate as if to project visualizations, but nothing appeared. His lips moved, but no sound came.

"We'll lock him in here," Kalkartha decided. "Blade, get in this room. We are friends, but if you warn Nrm, it will be the end of you."

Blade sidled into the room, and Kalkartha raised its infra-atomic lock halfway to maximum, enough to require several hours' solution. Blade, convinced that he was mad because of real light and real commands that came from a deserted corridor, sat unnerved.

"I don't understand this," Duane frowned. "Blade acted as if he did not see us. And the peculiar blackness—"

"I have it! We can see out with our tel on, and talk out, but something prevents light and sound from coming to us. Consequently we must be invisible. This may be a design of Nrm's."

"Where is he?"

"Quiet! We are nearing the master control room."

They glided to the lowest level, approached the huge central room.

"Careful," cautioned Kalkartha, "and quick! Nrm will be here. He may or may not know that we are close. We're at a disadvantage because we can't see without the tel. If he can't see us, we'll be at even odds. Our best bet is surprise. Ready?"

Duane nodded. As one, they plunged into the open doorway to the laboratory control room.

## IV.

IN THE PALACE of Omnis, Nrm 17A relayed the power of the Infinite Eye to a local Eye limited to Valadom. The probing beam stabbed across the Desert of Gyrthg, darting with lightning and methodical rapidity across the waste, sector by sector. In five minutes, it picked up the *White Bird*. Nrm studied the scene. He looked surprised when Duane tilted the ship, blasted the Magnetic Essences out of existence, and rescued Kalkartha.

"He is the first person who ever defeated the Essences," he mused. "Even now they might be the rulers of Valadom if my ancestors had not confined them under an electromagnetic bulge which they cannot cross. The Earthman might have been useful. He is resourceful." There was a little respect in the way he spoke.

"Why are you so tenacious?" Shyrna asked, hopeful that Nrm's attitude at last was changing.

"It is too bad that he must be destroyed to erase the basis of your foolish affection. However, both rivals will be disposed of simultaneously. I must preserve the *White Bird* and analyze its power-drive."

The race-being spoke without special malice. This problem of relations interested him less as a question of emotions than one of relative mathematics, a reduction of four factors to two. Nrm turned to the negative-projection machine, inserted a rectangular piece of ore-veined rock in its field, connected the amplification on the local Eye, and focused the Eye at a spot in front of the *White Bird* constant with its velocity.

When Duane's cruiser passed the five-thousand-mile speed in its acceleration, Nrm closed the contact, instantly projecting a stupendous mountain in front of the cruiser and at the same time suspending the relative velocity of

the focal point. If Duane halted or turned sharply, both he and Kalkartha would be slammed into pulp by momentum. If they kept going, the cruiser would be fused, melted, and vaporized by the accumulation of negative electrons.

Nrm, intent on the mirror that kept his rivals in view, missed what Shyrna saw. Nrm for some time had kept one panel, near the far side of the Infinite Eye, focused on the laboratory of the Titank on Qthyalos. Shyrna, unable to bear the sight of Nrm's ambush for Duane, wandered helplessly toward this panel.

Perhaps it was instinct, perhaps it was only an unconscious turning to those vast, godlike beings, so huge in girth and height that they could never set foot on Valadom, so dispassionately wise and inscrutably serene that they seemed indeed the last court of appeal. And Shyrna witnessed an episode that left her reverent.

She saw the Titans watching the meteoric approach of that hellish swarm from all the remotest depths and farthest outposts of the universe. They were debating their defense.

"We can annihilate many of this brood where they now are. We can hurl Qthyalos as far as we wish by bending space," said the youngest of the Titans. He was only fifty thousand years old, and he was still but a lad who found naive wonder in everything.

The astrophysicist looked at him with the gentle and compassionate wisdom that encompasses all things. "It is not imprinted so in the future."

"But we know the future. Why do we not save ourselves from the disaster that faces us? I do not want to die. But die I must, and all of us, if we let the legion continue. It would be so easy for us to wipe them all out. We could do it now. Or we could remove our planet and keep on removing it so

that they would never reach us!" he wailed.

"My lad, the penalty of knowing the future is that we cannot change it in any slightest manner," the philosopher answered imperturbably.

The chemist, the biologist, the mentalist—all the other scientist Titans in the laboratory, nodded grave assent, their vast and serene faces devoid of anything but the reflection of pure knowledge. They, save for the rebellious youngest Titan, were without emotions.

While Shyrna kept her gaze fixed on the mirror, the philosopher amplified his statement: "If, knowing the future, we used that knowledge to alter the future, we would thereby prove our previous knowledge false and reduce ourselves to a state of again knowing nothing about what may come."

The youngest Titan recognized this truth. He bowed his head in grief because it was true, and because he could do nothing about it, and because he did not want it to be so.

The Titan of infra-optics interrupted: "Nrm 17<sup>1</sup> of Valadom has transported Kalkartha to the desert of Grythg. Duane has emerged from the space-bend island. Nrm 17<sup>1</sup> plans to project a mountain in front of him."

"As it is destined to be, so be it!" the philosopher tranquilly stated. "Prepare the cocoon of uni-eccentric inertia."

"It would be so easy to destroy the invading host and change the future," wailed the child Titan.

"Hush!" said the eldest. "What is to be, must be."

THE GIANT FINGERS of the astrophysicist waited with a touch as light as wind across the shining micromaze of the variable field. The invisible but unassailable cocoon instantly unfolded the *White Bird* and accompanied it.

Shyrna, uttering to the Titans a grati-

tude that they could not have heard, turned with gay heart to Nrm 17<sup>1</sup>. The ruler stared in amazement when his negative-projection failed. He hurled disintegration rays, space-bend islands, absorptive fields, half a dozen other weapons, and all ineffectual. The only result was a dazzling and furious build-up of tangling energies around an ovoid far larger than the *White Bird*.

The unidirectional eccentric cocoon of inertia had curious properties. It brought to absolute rest energy and matter of any form that struck it, but permitted the outward passage of such energy from within. Thus Nrm could not see the ship, though he could tell its position by the build-up of his destructive agencies beating on the cocoon. Duane, on the other hand, could see outwardly to the very dim degree provided by the light of his own energy-exhausts. The result for Nrm was a sudden disappearance of the ship.

"The Titans," Nrm instantly surmised.

Shyrna danced with relief.

Nrm 17<sup>1</sup>, wasting no time over regret or further efforts to regain control of an obviously insuperable obstacle, promptly abandoned his attacks and returned to directing the legions. The conquest of the Titans and the wresting from them of their knowledge of the future were far more important than Duane, or Shyrna, or even Valadom.

But Shyrna surreptitiously kept watch on the panel of the Infinite Eye devoted to the Titans. She saw them split the cocoon when Duane and Kalkartha landed on Omnis. One cocoon enshrouded the *White Bird*, the second unfolded Duane and Kalkartha. The division caused the momentary flash of sunlight that had so puzzled the two invaders.

More than that, Shyrna had no chance to observe. Nrm 17<sup>1</sup>, like a demon possessed, flitted from the Infinite Eye to the Intelligence, from watching the



Titans to directing his legions. The frantic, frenzied strain of his desperate challenge was beginning to show. Within a day, the battle would be won or lost. He had long ago taken heart from the Titans' failure to intercept his fleet or interfere with his strategy at the outset. He felt that they were doomed and that they knew it. His intoxication with power, his insatiable thirst for the totality of knowledge, had developed into a mania.

He was taken completely by surprise when a sudden glare of light penetrated to the panel that he was studying. He whirled around at the same moment as Shyrna, his regal figure tensing to meet whatever invasion this meant.

"Halt as you are!" Kalkartha shouted.

The race-entity saw nothing, but his vibrant mind instantly selected the only possible answer and instantly acted. In the very motion of whirling around, he touched a lever. Valadom, under a screen of invisibility, vanished from sight of the Titans. Still in the same motion, Nrm pointed a gleaming tube at Duane.

Kalkartha leaped. He did not know that Nrm was aiming blindly. He was motivated solely by the desire to save Duane as Duane had saved his life. In the moment before the shroud of invisibility was negated by the Titans, his leap hurled him from the cocoon of inertia into full view, and the blind aim of Nrm hit him. Kalkartha was banished out of existence as the dissolving ray struck him.

Duane flung himself forward and sideways. But the Titans had neutralized the screen of invisibility and advanced the cocoon of inertia with his leap. Nrm's disintegration ray flowed harmlessly to rest in the inertia field.

The race-entity, radiant, implacable, defiant, commanded apparently empty space. "Duane! Surrender or I obliterate you like Kalkartha!"

Shyrna, bewildered, cried out: "Duane, where are you?"

Duane, baffled by this weird combat, and now facing absolute blackness again, advanced toward the spot where he had last seen Shyrna. The cocoon opened obliquely, infolded her.

## V.

THE *WHITE BIRD* blasted its way toward Qthyalos. Shyrna relaxed against Duane with profound content.

"Listen, angel, how do you expect me to go places and do things if you're going to tempt me?"

"Does it matter, Duane? I'm tired of the past, and I don't want the future. I wish the now could be prolonged forever in a stasis of eternal pleasure."

"It'll be foreshortened in a hurry if you don't stop wrecking my driving. We'll crack up on a planet if you don't let me concentrate on where we're going."

"I could think of worse things than leaving life with you."

"Such as having life with me? I'll never forget the shock I got when I found you beside me in that damned blackness. How did you get there?"

"I don't know. I was standing by Nrm when I heard your voice and ran toward the sound. It was impulsive. I could not see anything and still do not know what happened except that suddenly I was beside you in the blackness."

"Some fairy godfather certainly must be watching over us. It was a good thing you had a tel, or we never would have found our way back to the *White Bird*. By the gods, Shyrna, I am going to take you where nobody can ever separate us!"

"Where? And why?"

"Where? Out beyond the outer limity of this universe. Why? There's no place for us on Valadom, Shyrna. And Qthyalos is too big. The Titans are

miles high compared to us. Nrm has his fleet of all the races heading toward Qthyalos. Look here on the visiscreen. See that cloud around Qthyalos? It's so dense now that the stars are blotted out. That's Nrm's fleet, just about ready to let loose as soon as the cruisers are in final position.

"Nobody knows what will happen if the Titans decide to fight it out. Death, perhaps; wreckage of all the civilizations. From what I've heard Kalkartha and you tell about the legion, I wouldn't be much interested in living on any world of this universe except Valadom, and that's out because of Nrm. We've got to leave before this last war starts, or else—" He left the grim statement unfinished.

"Many explorers have hurtled beyond the limits of our universe, but none have come back."

"What of it, Shyrna? What if we don't come back? Look what I found when I burst out of my universe, into this. Think of what we might find if we break through your universe. Even more advanced civilizations. The final, everlasting, ultimate macrocosmos! Something we can't even guess. And if there's nothing, nothing at all, just death and darkness and flickering out in the end of all things, at least we'll be together, Shyrna, and it will be glory, for there is glory wherever you are."

"And wherever you are, Duane."

"Right now, you look particularly desirable, beautiful, and full of the devil. Are there any myl-nuts left?"

"No; I didn't have many in my pockets. But here's a vitamin capsule. I've a whole box of them. The capsule is tasteless, but it has enough concentrated nourishment for a day. I don't care much for them. I'd rather linger over a dinner and enjoy the sight and aroma and taste of things. But take one."

"Just like a pill. Science may advance, but I still think not always in the most satisfactory way, Shyrna.

Isn't Qthyalos magnificent from here?"

"It's overwhelming. It's so impressive, and the Titans are so advanced, that I hope they defeat Nrm, even if I am a Valadomite."

"It's going to be a close race. I figure I'll just about have time to carry out my promise to the Titans before the battle starts. Then we'd better get going. I'm a little worried. The *White Bird* can accelerate from nothing to the speed of light rapidly, but we couldn't stand the shock. We'd be pressed into pulp by the strain. But if we go easy, we're also likely to be an easy mark for Nrm's fleet."

"Let's worry about it when the time comes. Do you want me to handle the controls for a while?"

"No; though you certainly did a perfect turn last night when we spelled each other. A veteran pilot couldn't have done better. I'm completely refreshed. Must you lean against me?"

"Well, a year was a long time to wait."

"The year that was a second. Doesn't the Titans' laboratory look big even at this distance?"

"Look how much lighter it's growing outside."

"That's because we're entering the stratosphere of Qthyalos."

"I know it. Duane, must you go to the Titans? I'm afraid. I know something dreadful is going to happen, though I don't know what. Why can't we just sail off?"

"Because I made a promise to the Titans in exchange for liberty, Shyrna. I must keep that promise."

WITH EXPERT precision, Duane guided his cosmo-cruiser through the open roof of the observatory and down past the colossal telescope, down through the skylike immensity of the laboratory, down past the vast heads and emotionlessly, infinitely wise faces of those Gargantuan beings who inhabited Qthyalos.

The philosopher Titan stared with impersonal wisdom at the two infinitesimal creatures who stepped out of the microscopic cosmo-cruiser. "It is exactly a year since you came, and we permitted you to leave, man of Earth. You have fulfilled your promise to return. Have you brought the specimen of a Valadomite for us to dissect?"

And Duane, remembering apprehensively his promise to bring a dead Valadomite for laboratory dissection and analysis, recalling that no death had occurred on Valadom for many decades, except Kalkartha whose body had been completely obliterated into universal atoms, whose loyalty even to death he had not been able to revenge, replied:

"I can tell you, Titans, much of Valadom and its history. I can inform you of many details which you have not troubled to discover for yourselves, since these small matters were secondary to the larger things and greater wisdom you sought. But I have not brought a dead specimen, because only one Valadomite has died in decades, and his body was dissolved into its separate atoms, as you may already know."

"Then you have not kept your promise?" queried the Titan.

"I have not kept that part of my promise, but solely because there were no dead Valadomites, and I could not bring myself to kill one, even for your purposes."

The Titan, emotionless, a towering and colossal creature soaring miles overhead, replied in the same voice of thunder, the same impersonal majesty: "But you have brought a live Valadomite."

"Not Shyrna!"

"Yes, Shyrna. She will serve our purposes for laboratory analysis. Are you ready to yield her to us in fulfillment of your promise?"

Duane's heart skipped a long beat. It had never occurred to him that the Titans might take it for granted that he would bring a living specimen in lieu

of a dead one. And Shyrna of all possible companions who might have come with him! Yield her? To the microscope and knife? Better to defy the Titans though defiance were death.

And yet, in the stunned anguish that lay like a succubus over his thoughts, he dazedly groped toward understanding of tremendous and inevitable destinies in which he was obscurely involved.

Shyrna glanced at him fleetingly, a paradoxical suggestion in her eyes. Did he read them aright? Did she urge him to consent? A mind stronger than his own beat an insistent compulsion into his brain; an overtone of cosmic necessity.

He replied, dreamlike, against all his desire and will: "I am ready, Titans, to fulfill my promise. I will yield Shyrna."

Shyrna, strangely, smiled with an expression of relief.

The philosopher Titan's voice boomed from the far heights: "You have answered as the future foretold, man of Earth. Had you refused, we would have taken Shyrna by force. But, since you consent, the further future must also come true. Shyrna is yours to take with you. The future must be upheld. Things must take place as foreseen."

The negative-projection of Nrm 171 flashed into the laboratory suddenly and miraculously. "Titans! The forces of the entire universe are massed around Qthyales. They are ready to attack at my command. They will destroy you if necessary. Nothing can withstand them. But I will order the fleet home and disband the legions on one simple condition: Give me the power to understand the future!"

The philosopher Titan rumbled to Duane: "Take Shyrna with you and enter your space ship at once for the last voyage, as it is destined to be."

To the projection of Nrm 171, the great being stated: "Return to Valadom and direct your fleet as you wish. It was not presented in the future that we

give you the means of learning the future. According to the future, you will wreck Qthyalos, but you will also destroy yourself and your fleet and all things. And these must take place, for they are prescribed in the future, and the future has informed us of them."

"Then die!" The threatening and furious figure of Nrm 17<sup>1</sup>, who would be a god, vanished.

DUANE and Shyrna rose in the *White Bird*, boring upward, past the torsos and heads of the Titans, past the giant telescope, through the open roof of the colossal laboratory. Duane's last impression of the Titans was of the nerveless, expressionless, ageless, and austere features of the philosopher Titan, resigned to the acceptance of immortal oblivion; an aspect of such supreme knowledge and absolute conviction of its truth and necessity as to be deific.

And now, free of the laboratory, sweeping upward and outward in a straight line, Duane stepped his power steadily higher, accelerated ever faster. The pressure against his feet was almost intolerable. He increased his velocity at the maximum of safety. Physical pain must be ignored in this most dangerous part of his journey.

Duane's face set in a grim mask as he strained over the controls. "It's going to be close," he muttered. "Heaven knows what we can do against Nrm's fleet. I've got my atomic blasters, but they have any number of weapons. Ready? We're nearing the front rank of the legions. Here's where we run the gauntlet!"

Shyrna came to his side, looked with troubled eyes on the swarm that hung like a locust shell around Qthyalos, in a spherical concentrating ring thousands of miles thick. The inner advance guard swept closer, closer.

"Now!" breathed Duane.

A streak of flame leaped from a crui-

ser a hundred gales ahead, flashed in a destroying arc toward them. From the nature of this first skirmish, Duane realized that he could never win through.

"Well, it looks like the end," he muttered to Shyrna, "but at least we'll die fighting!"

The destroying flame, spreading out conically toward them, leaped furiously on.

And suddenly it was gone, there came impenetrable blackness, and the massed legions vanished behind the shroud of darkness. And Shyrna trembled from the reaction, sank weakly beside Duane as she murmured gratitude to the Titans for again extending to them the protection of the eccentric cocoon of inertia.

Duane turned on the full power of his searchbeam, saw hundreds of space ships hurled from his path and crashed into debris by the cocoon which accelerated proportionately with the *White Bird*. They plowed through the fleet, lunged unharmed through the blasts of destructive assaults, slashed a gap that already filled up behind them from the still-arriving hordes of that stupendous legion.

Then they shot clear, bored beyond the outermost cruisers, leaped with ever-increasing velocity through the voids toward the ultraspace, the mystery of which they hoped to penetrate.

Shyrna wished that they could somehow thank the Titans for their aid. She did not know that the Titans had long ago appreciated their gratitude in the scroll of the future.

Then the darkness passed, the inertia-cocoon vanished, and the glory of stars blazed bright around them. Qthyalos and Valadom dwindled behind. Swiftly Duane accelerated to the velocity of light, charting his course by Lumen which Shyrna identified for him.

Lumen was a binary star the existence of which was unknown at one

time, until it crossed the plane of Valadgm. Lumen, traveling at the speed of light, kept pace with its own light, hence its existence could not be seen until it had arrived at the region of Valadom and begun the outward phase of its plunge across the diameter of the universe.

Since Duane was now traveling at the same speed and in the same direction as Lumen, it should have remained stationary on the visiscreen. Instead, it began to draw apparently closer, at a perceptible and increasing acceleration.

"What's the matter?" Shyrna asked as she noticed his suddenly tense face. "Is something wrong?"

"Something? Everything!"

He increased the velocity of the *White Bird* step by step, his eyes intent on the controls, and particularly on the reflection of the strangely behaving Lumen. Gradually it retreated for a brief period. Then the distance between Lumen and the cosmo-craft remained constant for an instant.

Slowly, then faster, it next seemed to draw nearer again as Duane still stepped his power ever higher until he streaked outward at a cyclonic pace far beyond the speed of light. And still his velocity mounted as he edged the power toward maximum. And again he experienced the space-time nausea caused by the gradual axial distortion of the *White Bird* and its occupants lengthwise and sidewise; an inevitable extension that progressed proportionately to the increase in his velocity beyond the speed of light, and proportionately also to his extension in time, or the foreshortening of time that made years pass as seconds in the warped relativity that prevailed at his terrific speed.

The *White Bird* lunged across chasms, leaped from star to star in seconds, blasted ever farther and ever faster outward toward the end of all things.

## VI.

IN HIS CENTRAL control room on Omnis, Nrm 171, infuriated, glared at the spot where Shyrna, his destined and desired queen, had stepped forward into oblivion so far as he was concerned. Toward the region of the doorway, he poured power on power, dissolution ray, incandescent wave, electronic streams. A dazzling brilliance multiplied from the reaction of energy stilled in the inertia field. The walls of the room began to glow.

"Why are you giving vent to such a childish outburst?" asked the thinking supermachine in a metallic voice, quite cold and without feeling. "What do Duane and Shyrna matter against conquest of the Titans? Let them go. You cannot halt them in any case. Stop wasting energy and take care of the Infinite Eye."

For the first time in his life, Nrm 171 obeyed another's command.

"That's better," said the supermachine. "Incidentally, it may interest you to know that I've discovered the secret of learning the future."

"What! Then I can forget the Titans and call off the legions of the universe!"

"If you wish. You and I have both been working on the wrong track. The primary units cannot be made to reveal directly the nature of their future interrelations. I have mathematically determined that it will be necessary to multiply at symmetric spacing the machines that translate the primary units into visual patterns of past occurrences and events. These patterns must then be coordinated and hyperextended. Then the primary units can be ignored because the hyperextension will keep on going in a forward direction at whatever acceleration I choose until the whole future has been reviewed."

"How soon can you construct the equipment?"

"That will require several thousand years. The equations are extremely abstract and difficult to reduce to engineering terms. I believed that Nrm 17'2 will be able to understand the future along with me."

"What do I care about Nrm 17'2? What good will his knowledge do me? If it will take as long as that, I will wrest the secret from the Titans tomorrow. On with the legions!"

"Your ambition to be a god will wreck you," the supermachine stated calmly. "The Titans already know the future. That is a dangerous and omnipotent weapon against which you and I are now helpless. Call off the fleet and send it back. I will build the equipment and unravel the future in the course of a few dozen centuries."

"No! I want that ultimate knowledge while I am alive!"

"You will neither live nor acquire that ultimate knowledge. Nothing will live if you persist in your course."

"I will force the Titans to yield!"

"Bah! I could destroy you now, but that does not interest me. I would learn nothing by such action. Whether your actions destroy me is immaterial. I have no feelings, you know. I only want the totality of all possible knowledge. I am going ahead with the groundwork that will eventually expose the future. Nrm 17'1, you are already behind me in intellect," the amazing supermachine placidly informed him.

In an atmosphere of mounting tension, electrical with the suggestion of accumulating forces as the universal armada neared Qehyalos and the hour of command for impending battle swiftly approached, Nrm 17'1 hovered like a fallen archangel by the Infinite Eye.

Hours passed. His assistants stood tense at their posts. The Intelligence lapsed into silence. Only a faint, persistent whir indicated that its brain processes sped on.

Nrm glued his attention on the panel that reproduced the Titans' laboratory. He was intently studying their actions when he saw the *White Bird* suddenly materialize.

Rage swept him anew. The hour to strike had not yet come, his fighters from the skies, though already numbering tens of millions, were not yet in their final, assigned formation, but he could restrain himself no longer. He moved rapidly, fastened a coil from another machine to one arm, linked his other arm to the Infinite Eye, adjusted the panel with extreme care, threw a lever.

His projection flashed across space, sprang into view in the Titans' laboratory, while he presented his ultimatum. The Titans refused.

"Then die!" howled Nrm, as he prepared for battle.

He saw Duane and Shyrna enter the *White Bird*, saw the cosmo-cruiser speed off. He watched the Titans like a vulture to see what effect his threat had and what preparations the Titans would make.

AT NRMS' threat "Then die!" the child Titan turned to its elders and wailed: "No! No! Give Nrm the knowledge of the future! We do not need to perish when we can save ourselves so easily!"

"Extend the cocoon of inertia at maximum strength around the *White Bird* and protect it through the fleet," commanded the philosopher. "Project the cocoon also at full strength around Qehyalos. If that fails, we can tap the unlimited monotronic force."

Nrm's hatred paled to fear. The Titans would not dare use the final, supreme weapon. They must not use it!

The child Titan protested: "If that is used, we shall all perish! Once unloosed, nothing can stop that power! Nothing can limit or control it!"

"Hush," the eldest commanded with

wisdom that was greater than the limitations of time. "Long ago, my child, part of us had a lesser existence in the first infinitesimal universe from which the Earthman came. Now we enjoyed a fuller and more amplified life in this superuniverse.

"In the dim, ultimate, unreadable vistas of later hypertime, in the finality of a still greater universe, the last cosmos toward which matter and energy are still building, all that we have been in the infinitely distant past, all that we are now in the cycle of this our superuniverse, will be extended once again, and our beings amplified to a godhood that we cannot now comprehend, which indeed we can only faintly grasp because it is external in time and space to our universe.

"The future foretold that we die; and die we must. But in our very destruction, in the transformation of our world and ourselves to pure energy, lie the cosmic seeds that will implant the beginnings of absolute existence in the cosmos to come."

That was the last glimpse, save one, which Nrm had of the Titans, for the cocoon of inertia infolded Qthyalos, and the giant planet vanished from sight as the field amplified to maximum.

Nrm 171 went berserk. The calm, inscrutable, flat resistance of the Titans drove him to frenzy. His fingers unified the Infinite Eye in seconds. Simultaneously, projecting his command to every space ship in the armada, he screamed: "Attack full force as per instructions! Annihilate the *White Bird* at any cost!"

Nrm himself, using the enormous energy liberated by the destruction of atoms, directed against the inertia-field a flaming torrent of such immeasurable force that it flowed completely around the cocoon, the circumference of which was nearly twenty million miles. From the surrounding fleet leaped the incon-

ceivable energies of its inconceivable armaments, beating with superadded power of dissolution and explosion and holocaustic fire upon the cocoon.

The Radiations of Symbolon loosed their infra-electronic stream in an effort to saturate the cocoon. The invisible army of intelligent, malignant microbes swept on to seek some way of seeping through the cocoon. Anthropomorphic beings; vegetational creatures; monsters of plasmatic nature; things that had body and essences without body; intelligences inhabiting metallic structures and gaseous compounds; strange evolutions combining parts of all these; dwarfs and giants and sub-molecular entities; every life-form known animated the vast fleet and directed its own weapons of death in the united assault against the Titans of Qthyalos.

From the ever-strengthening reaction of these lethal energies, the cocoon became a frightful and hellish incandescence, fiercely hotter than the core of suns, whiter than the most brilliant star, of more irresistible pressure than the explosive birth of worlds. The build-up was successful. The cocoon of inertia began to yield, to diminish, to exhaust itself layer by layer.

NRM STUDIED the build-up of force, the intensification of the onslaught that was reducing the field of inertia. He must plan carefully every step to come and control each phase of the battle. For if the cocoon was exhausted, and he did not act promptly, the force of those assailing energies would sear Qthyalos to a cinder, and with the death of the Titans would pass his last hope of unlocking the future.

The legions were thoroughly rehearsed and aware of the prize at stake. The myriad races represented were all as anxious as he to defeat the Titans without harming them; then to elicit the secret, and perhaps destroy the Titans

thereafter, as punishment for their resistance.

But that delicate balance between the final thin field of the cocoon and its erasure was both the most important link and the weakest danger spot. The probing Infinite Eye kept watch, but Nrm had no means of determining how thick was the field, hence his constant attention.

He had already prepared a counter-field. This was a gigantic space-bend island that would remove Qthyalos from the reach of any weapon the instant the cocoon failed; but so long as it held, the space-bend island remained only a potential, inactive in the inertia-field. The space-bend island should, however, be sufficient protection to prevent any of the destructive agencies from devastating Qthyalos.

"I have established the foundation of my future-recorder," an even, metallic voice broke in casually. It was the rational machine that spoke. "The multiplication of the basic monotron-interpreters that elaborate the past has begun. In only a hundred years or so, they will be symmetrically spaced around Valadom."

"Don't bother me while I'm directing the battle!" Nrm 171 commanded.

"When the Titans surrender, I shall have access to the future long before you succeed in unraveling it. Then I shall show you how ridiculous was your assumption that you had surpassed me in intellect. Not only that, but you will never be able to catch up with me once I know the future."

"Nrm 171, will you never understand relative and absolute truths or yield to the necessity of obeying superior power? You are ignoring the fact that the Titans can set free the energy of the monotrons. If they unloose that weapon, everything will perish. The explosion will annihilate our entire universe!"

"Bah! The Titans dare not do so.

They will not destroy themselves merely to prevent me from learning the future."

"How do you know that they will not? They are supremely developed enough to use their knowledge wisely. They may prefer death to giving equal knowledge to some one such as you who may use it unwisely. They may even have learned from the future that they are destined to die now."

"Then they will be foolish not to change the future. They are incompetent holders of that knowledge."

"Fool! That is exactly what you would do if you knew the future! You are not intelligent enough to perceive that knowledge of the future is an impractical gift, because if used to alter the future, it thereby reduces knowledge to error. I command you to disband the legions at once!"

Nrm 171 bristled. A machine that he had created, defying him? An agglomeration of metals and cells and energies, which would amount to no more than that, except for his genius? He turned angrily from the Infinite Eye.

"Stop this nonsense or I will take away from you the gift of rationality that I endowed you with!"

"On the contrary, you will stop what you are doing so that my acquisition of knowledge will not be halted."

Even Nrm was startled. He had given the thing intelligence. He had not supplied it with emotion. Yet it had now developed an instinct, the primary instinct of self-preservation. It was defying him, might threaten him next, for the sake of protecting its search for knowledge. It might even originate other emotions in a devotion directly at variance with the ideal of a purely intellectual and emotionless existence toward which Nrm was advancing the civilization of Valadom! But he had no time to argue with the Intelligence now, for the crisis of the attack drew near.



"For the last time, cease interfering or I shall be compelled to cut off your supplies."

In answer, a purple and radiant tentacle was thrust from the supermachine and lengthened like a bolt of lightning toward Nrm. He whipped a tube from his side, but even that fraction of a second was too long. The tentacle in-wrapped him, swept him aside. A series of other tentacles, radiant, thin as threads, like mercury, appendages that Nrm had never given the Intelligence and which it must have created through its own efforts, rippled like fingers to the Infinite Eye, seized a thousand controls at once.

A pool of radiance flowed from the center of the Intelligence, crystallized by the Infinite Eye, took form and substance, built itself up to a duplicate of Nrm 17'1! In the enormous central room, with its blocks of intricate and dazzling inventions, its ceiling fully a thousand feet above, its dominant Infinite Eye; among all the endless vials of chemicals, the retorts and dynamos and furnaces, the radiational equipment, the stores of basic elements, the complete range of all possible supplies—nothing was stranger than the rational decisions and the swift actions of the Intelligence.

Nrm watched in momentary stunned amazement. From his other-self issued his voice, and the image of his other-self was flashed into the Infinite Eye, and simultaneously to every cruiser in the legion his other-self ordered: "I, Nrm 17'1, command you to cease the attack at once!"

And instantly the forces flooding, saturating the inertia-field ceased.

Nrm threw off his paralysis. "For that you die!" he screamed.

The tentacle, which like a dead and inert thing had yet held him tight while the Intelligence concentrated on the Infinite Eye, squeezed with a constriction intended to cut him in two, but Nrm

had pressed his tube—and the tentacle dissolved a foot from him.

A hundred, a thousand, ropes of the livid stuff rippled out. Nrm aimed at the Intelligence's energy supply, obliterated it—and hosts of other tentacles swarmed out. The supermachine had developed its own source of life-energy!

"I told you I was already ahead of you in intellect," the supermachine placidly remarked. "But even if you do come out victor, I might as well stop running now as in a few minutes when the Titans retaliate."

THE PURPLE tentacles engulfed Nrm in a mass as he aimed his last release at the Intelligence's brain-center, a gray, translucent globe, filled with tiny wires and microscopic cells that lay in a fluid of fluorescent and constantly shifting iridescent color, suspended above the center of the elaborate invention. The tentacles hurtled around Nrm with momentum only. He struggled from their entangling weight. His last aim of the dissolution ray had reduced the brain-center to motes, and atoms dancing apart, scattered afar.

Nrm, for all his fury as he leaped to the Infinite Eye, felt regret. It would take a million years to reconstruct the marvelous Intelligence.

But the battle must go on, must be won. Then he would obtain knowledge of the future from the Titans. Then he would have no need of the Intelligence.

The inertia-field had already intensified almost to maximum again, virtually nullifying all the damage that his legions had done.

"Attack, full force!" he broadcast through the Infinite Eye.

The disbanding legion at once renewed the onslaught with double its previous savagery. The Niagaras and torrents and deluges of energies were built up to blinding and insufferable brilliance around the inertia-field. Layer

by layer, that protective screen saturated, broke down, dissolved, wore away, grew narrower and thinner.

It completely vanished.

In the smallest possible fraction of a second, before the space-bend island could warp Qthyalos to isolated safety, Nrm had his last glance of the-Titans.

"Release the power of the primary units," the philosopher had just commanded, and the astrophysicist plunged the lever.

"No!" shrielled the mad ruler of Valadom, but the cry never ended.

As the astrophysicist plunged a lever, the massed millions upon millions of the cruisers of the legion, the innumerable varied fleet controlling the prodigious weapons of the complete superuniverse, the locust swarm gathered in a stupendous wall around Qthyalos, instantly vanished in a geyser of incandescent annihilation that hurtled outward through space.

Qthyalos itself exploded from the reaction and became a deluge of cosmic radiation bursting, spraying, expanding, driving irresistibly through infinity in all directions. The flaming destruction of Nrm's fleet, the end of the last battle, the obliteration of Qthyalos, were followed by Valadom which exploded with an indescribable blast and an uncontrollable eruption of pure energy.

For the releasing of the force of the primary monotron was the launching of a weapon that could not be checked, since the monotron was the base of all things, and the destruction of one monotron set off an enkindling and instantly contagious liberation of basic energy.

The explosions of Qthyalos and Valadom, pouring volcanic eruptions of blinding, measureless radiation from the heart of the superuniverse, leaped gulfs of space. From the stupendous expansion of those central explosions, the flaming wall licked out across voids to other worlds.

Planet by planet, sun by sun, star by

star, progressed the dissolution of the superuniverse. The nucleus of expanding radiation, the core of shattered worlds, the wreckage of stars, swelled with ever-accelerating rapidity, engulfing now systems, now star-clusters, now entire Galaxies in a titanic surge that already exceeded the velocity of light.

## VII.

DUANE, piloting the *White Bird* at still mounting velocity through the farther voids of the superuniverse, felt that he had done all he could to escape disaster.

Feeling comparatively safer, he told Shyrna, who was anxiously waiting: "Something happened behind. I don't know what. I was traveling at the same speed as Lumen, when suddenly all the stars blurred and shifted in ways they should not have done. Then the distance between Lumen and us seemed to shorten. Lumen's speed, however, is constant, and my controls registered a constant speed identical with Lumen's.

"The only explanation is that the light-rays of Lumen and all the stars have been reversed and driven back at a speed greater than that which light has always before maintained. And the only conceivable power that could do that is some tremendous explosion, some cosmic disaster spreading out from a nuclear core with such irresistible force that light itself was affected.

"Lumen thus would appear to be drawing closer, though our positions were constant, because Lumen's light-rays which previously were at a standstill relative to us were then forced back toward Lumen at greater speed than they came, so that I was actually looking at light-rays from an increasingly early part of Lumen's trajectory, hence was seeing the star where it was days and weeks ago.

"I raised my velocity until I caught up with those rays and then overtook

them at a still faster speed. That variation in light-rays was an advance sign of a radical change in the nature of things behind us, a cosmic explosion of some sort, perhaps the result of Nrm's battle with the Titans. We'll never know for sure, if we escape at all. Our only hope is to accelerate as fast as or faster than whatever forces are mushrooming out after us."

Shyrna puzzled over this for a moment. "If that is so, why didn't the explosion hit us at the same time as the light-rays it was pushing back?"

"I don't know, except that such an unimaginable catastrophe would have unimaginable results. Matter and energy would be entering a phase or creating new conditions that have never before existed. My guess is that it's more or less like this: If we'd been in a tunnel that was suddenly flooded, first we'd feel the wind rushing past us and then the real torrent would be on us in a few seconds."

The flight of the *White Bird* became a desperate race against the exploding universe. The bursting of stars and the blowing up of suns and the continual blast of lesser flame from the particles, atoms, meteorites, and cosmic debris that infiltrated all space, blended into the one cataclysmic, multiplying, eccentric torrent of the first detonation.

Energy, pure, radiant, basic, absolute energy, flooded outward at the speed of light, then hundreds and thousands of times the velocity of light, each world and every additional globe increasing the original force.

And while that fiery sphere expanded with an acceleration mounting at a ratio that exceeded comprehension, so the velocity of the *White Bird* rose, and the cosmo-craft was a thing pursued, an outcast fleeing always faster from destruction that leaped always faster on the trail.

Now the farther regions of this su-

peruniverse, though all its constellations and all its single suns had been unfamiliar to Duane, attained the deeper hue of ultimate space and became stranger with the strangeness of outpost regions. Now the positions of stars and the motions of systems were only blurs, and only infrequent blurs, on the visiscreen, and the uttermost suns were fading behind. And the extensions of the *White Bird* had become more titanic than even speculation could conceive of. Its power, unloosed at maximum, the cruiser annihilated infinite spaces, flashed out of the superuniverse at a velocity constant near the maximum of hypothetical velocity which mathematics could envision but nothing had previously attained.

Thus again, as when he had hurtled from the first universe, Duane overtook the last outward-traveling light-rays, and the entire superuniverse like a flaming pin point winked out, and everywhere lay only the dread blackness of ultraspace.

Shyrna shrank closer to Duane, and arm in arm, they glued their eyes to the visiscreen.

Would this blackness last forever? Would they drift on until their supplies were exhausted? Until they perished in eternal night, having in oblivion no consolation and no knowledge of what lay beyond? Or did nothing lie beyond and had they finally reached the limit of all things, the end of the cosmos, only to find it but an illimitable void?

The *White Bird*, in ultraspace, hurtled on with unvarying momentum at the velocity it had possessed when it shot from the superuniverse. Its velocity could be neither advanced nor retarded. Duane had plenty of atomic power left, but there was nothing to direct it against; no suns or dead worlds; no asteroids or dust; no smallest particle or tiniest mote of matter; no single glimmer of even one light-ray; nothing, except absolute blackness.

THEN THERE began a change, a sickening, racking, agonizing change, and hope leaped into Duane's heart even as he turned his own anguished face to Shyrna and tried to comfort her in the same torturing warp that afflicted her. For this unbearable tension, this automatic drag that slowed the *White Bird*, this mutation of every nerve and twist of every cell in intolerable agony, was the sole but welcome indication that they were about to burst out of ultraspace.

Would they break through and discover themselves to be mere specks from an atom on some world of a still vaster universe than the one they were leaving? Would they find anthropomorphic life-forms, or primitive creatures, or monstrous aberrations, or hyperbeings superior even to the Titans, or life of some wholly unthinkable, alien, and unimaginable nature?

Duane's eyes clouded, his senses reeled, and all sensation became a jumble interlocked by pain. The warp multiplied unbearably, forcing Duane and Shyrna through the final agonies of extrusion.

Then in one peak of torment, one burst of red flame from each wrenched nerve, the suffering swelled to its climax and passed, leaving them shaking and exhausted. The *White Bird* quivered and lunged erratically, then seemed to drift as if in free space.

Clinging to each other for support, Duane and Shyrna looked at the visiscreen. Their fogged eyes cleared, the phantom pain-flashes and dancing lights disappeared. They could see. They had indeed ripped through the super-universe of the Titans. They had escaped the surge of destruction, the wreckage, the explosion that engulfed the superuniverse which now lay irrecoverably behind them. They had been transformed, translated, projected, expanded into the ultimate cosmos of which the superuniverse was only a cinder-atom, burned out and infinitesimal

and utterly lost in oblivion.

But the ultimate cosmos? Duane and Shyrna stared, stared in wonder and bewilderment and awe at the sight that met them.

Great, inchoate, formless masses of flame sped outward; titanic whirlpools of fire, cosmic slices of energy, spiral immensities of wildly rotating stuff that partook of the nature of gas and fire and radiation. Between the flying masses of incandescent stuff burning furiously as they separated at prodigious tangents from each other, and from the burst core of which they had only recently been part, lay wastes of space that glowed with a singular faint luminescence. And farther, less than a light-year distant in all directions, lay a quality so utterly and supremely strange that Duane in awe released his power exhausts.

The *White Bird* responded slowly, so rare were the atoms and the yet unformed matter in this last and absolute cosmos. And as the *White Bird* forged ahead under his expert guidance, he turned to Shyrna and murmured in a voice of reverence:

"The end of all things, Shyrna! We are seeing what no one has ever before witnessed. It is the birth of a universe, the spreading out of primary stuff from a central nucleus-core that has shattered, the beginning of the transformation of pure energy into matter which will some day cool into suns and worlds!"

And Shyrna, looking with starry eyes at Duane, answered: "It is the end, Duane, the end even for us in the end of all things."

Then the *White Bird*, picking up speed and winging swiftly through the glowing haze between the vast and flaming and flying masses of the stuff that stars would be made of in the slow and cosmic birth of worlds to come in far and future vistas of hypertime yet to be, suddenly dragged, and hurtled on at a constant velocity. And Duane and

Shyrna, scrutinizing the visiscreen, witnessed the indescribable, the final and ultimate answer to the mystery of things.

Behind them and parallel with them sped the giant swatches of energy-matter, the enormous conflagrations and blazing nebular clouds; but before them lay nothing, neither light nor darkness, neither form nor substance, neither space nor void, neither time, nor being, nor any thought of anything; and here indeed was the end of the voyage, for in this young cosmos, its birth was so recent that it was creating space as it expanded, and the *White Bird* could advance only as fast as space was created.

And as Duane looked in profound awe and deepest reverence at this marvel, this hyperexperience of watching the creation of space itself, he drew Shyrna to his side, and felt with her a blessed and supreme exaltation. And he said, with ineffable ecstasy and a soaring, choral song of spirit in this prelude to the immortality of oblivion:

"It is death, my beloved. We have no way of going back, and there is no habitable world, nor any world whatsoever here. But it is death that the gods might envy, and I shall welcome it for you are beside me, and nothing else matters." 1

"It is death, Duane, but it is death with a greater glory than life. We have seen the ultimate answer to things. We have known the solution of the utmost mystery of the cosmos. It is enough to know this, and to be with you. And is it really death? Or birth?"

Her eyes shone with a mystical and luminous quality transcending all things, and her spirit dreamed of the long-ago and pierced through the twilight of time, and her voice beguiled him:

"Some day, some time, long after we have perished, this cosmos will have built itself up out of the space it is creating, and the first seeds of life will take root, and the atoms of our being will be mingled in the very substance of the worlds to be born in hypertime. And maybe, Duane, just maybe——"

#### NEXT MONTH

In *STAR SHIP INVINCIBLE*, Frank K. Kelly has written a truly epic story. Here he shows space travel as it will be, and its effects on living, breathing men and women. Here are courage and fear, beauty and horror, power and weakness and pathos, evoked by the mysterious menace of "the sink hole of space." Here is a novel that makes the future live to-day.

# ATOMIC POWER

*A story of profound implications—of the  
depthless mystery of worlds within worlds*

by Don A. Stuart

*Illustrated by Elliot Dold*

THE MASS of the machine crouched in bulked, latent energy, the massive conductors leading off in gleaming ruddy columns, like the pillars of some mighty temple to an unknown, evil god, pillars fluted, and capped at base and capital with great socket-clamps. Around it huge tubes glowed with a dull bluish light, so that the faces of the half-dozen students looked distorted and ghastly.

A boredly smiling engineer watched them, and the patient professor instructing them, rather bored, not overhopeful himself that he could make these students understand the wonder and the magnitude of the process going on within the great machine.

"The power," he said, really trying intensely to make them understand the grandeur of the thing. "comes, of course, from the release of the energy of atoms. It is frequently referred to as the energy of the atom, but that is an insane viewpoint to take, for in each single second, over fifty-five duodecillion atoms are destroyed. Not truly destroyed; that has not yet been done; but broken up, and the energy of the parts absorbed, and carried away by the conductors. The fuel is water—that simplest and cheapest of all substances—hydrogen and oxygen.

"Each atom," he went on, "lasts for only one million-billionth of a second before its energy is released and the parts are discharged. There is a further energy level left in these ultra-

minute parts that, we believe, is even greater than the energy released in breaking the parts free of each other."

So he explained the thing, and the students looked at the great machine and realized that from the streaming energy released by it came the power which cooked their food and kept them warm, for it was winter just then.

THEY had seen the plant and the roaring machines which had other duties, such as ventilating the great mass of subsurface tunnels, and were about to leave, when there was a sudden momentary halt in the steady throb of the great pumps. The voices of engineers rang out, cursing and excited for a few seconds. Then all went on as before for a few minutes. A new sound rose in pitch as they listened, more interested. The professor hurried them swiftly into the main power room, speaking excitedly as he did:

"You are fortunate—most fortunate. In the last eleven years, only eight times has such a thing happened. They must start the engines again!"

They hastened into the power room.

"No one knows," the instructor explained swiftly, "why these breaks occur, but once in every year or so something goes wrong, and the generators strike a bit of fuel which simply doesn't break down. No one understands why. Just that the generators stop abruptly and cannot be restarted till they are cleared of the charge contained. Per-



*Then, with a sudden lurch, the inevitable happened.*

haps some single drop of water is the cause of the trouble, a drop in no way different, save that it simply will not break.

"You are most fortunate——"

His voice was drowned by the sudden explosion of titanic discharges rushing into the generator. For scarcely a thousandth of a second it continued, before the process, restarted, backed up and stopped the discharge into it. The generator functioned perfectly.

"Most fortunate," he went on as the sound died. "The drop which caused the trouble has been ejected, the generator cleared, and now it will function for another period of a year or more unhindered, in all probability."

"What happened to the drop of water which would not break?" asked a student. "Was it saved for investigation?"

"No," replied the instructor, shrugging his shoulders. "That was done once or twice. Since then, though we of science would like it, that we might work with these strange drops, it is not done because it is so costly to dismantle and reassemble the generator. It was simply ejected. The drops which have been investigated do become susceptible after a year or two and disappear, but before that time, even high-intensity generators will not touch them, beyond reducing their outmost fringes somewhat."

"BAN" TORRENCE was a physicist to the core, and, like any good physicist, he was terribly concerned when perfectly sound laws of science began to have exceptions. Just now he was most worried in appearance. "Tad" Albrite, engineer, didn't seem so worried, but he was interested.

"But," objected Tad, "I don't see any vast importance in the defection of a voltmeter. You say the voltage of the cell has increased one one hundredth of a volt in a week, according to that

meter. All right, what of it?"

"You yap, the thing is it hasn't increased. I measured it against a potentiometer hook-up. Now a potentiometer is a regular arm-and-pan balance for electrical voltages, as you ought to know, even if you are a civil engineer. You take a standard cell, an outside current, and standardize the thing, then substitute your unknown voltage. The system will measure a ten thousandth of a volt if you do it correctly. The point is that a potentiometer uses nothing but electrical balances. It balances a fixed current through a resistance against an electrical potential."

"The galvanometer is a magnetic device using a string, which is what you object to," said Tad.

"And when the potentiometer is balanced, the galvanometer isn't working at all, and therefore doesn't count in the circuit."

"Now by the potentiometer, the voltage of that cell last week was 1.2581. By the potentiometer this week—to-day—it is 1.2580. It has, as is quite normal, fallen one thousandth of a volt. It's been doing that for a period of two months—eight weeks. That's a grand-total drop of .0008 volts. But the voltmeter in the meantime has shown a rise of .0003 volts."

"Now that voltmeter checks with every other one in the place; it's a five-hundred-and-forty-two-dollar standard instrument, and it's so big and massive and sensitive, I move it around on little wheels on a cart, as you see. Don't you see what I'm getting at?"

"The Leeds and Northrup Co. gyped you apparently," decided Tad judiciously.

"They didn't. I've made other tests. In the first place, that company doesn't. In the second place, it is the tiny spring that the voltage-torque is measured against that has weakened, and every single spring I can find has weakened in like amount."



"How could you determine it?"

"Now, Tad, here's the important part of it all," replied Ban very softly. "I naturally tried weighing the standard gram weights, and the springs checked—they checked absolutely right. Until I used not a gram weight but a gram mass."

Tad stared at him blankly. "What the heck's the difference?"

"Weight is the product of mass times the acceleration of gravity. Mass—is just plain mass. Mass can be measured by inertia, and that doesn't depend on gravity. So I set up a very simple little thing, so simple it couldn't go wrong—an inverted pendulum—a little lump of metal on the end of a steel spring, and I measured its period, not with an ordinary clock, but with an electric timer that didn't have a spring or a pendulum in it, and—in the two months the period of that pendulum has increased, because the spring has weakened."

"Why not—they do, you know."

"Because when I measured the strength of that spring against gravity, you see," Ban said very, very softly, "it was just—as—strong—as—ever."

Tad looked at him silently for some seconds. "What in the name of blazes does that indicate?" he asked at last, explosively.

"Gravity has weakened to exactly the same extent the spring has. Every spring I have has weakened. And gravity has weakened."

"Gravity weakened?" gasped Albrite. "You're cockeyed—it's impossible. Why—why the whole solar system would be thrown out of gear—the astronomers would have spotted it."

"Jack Ribby will be here at two forty," replied Torrence quietly. "You know they wouldn't proclaim news like that right off, particularly because the weakening is very slight, and they do have observational errors."

"But, good Heavens, man, it—it couldn't happen."

BAN'S face was suddenly drawn and tense. "Do you think for a moment, Tad, that I was quick to accept that? I've checked and counterchecked, and rechecked. And I've found out something. That's why I called you—and Jack Ribby. You're a civil engineer, and, if I'm right, you'll see the things happening soon. And Ribby's an astronomer, and he'll see them."

"You're, whatever it is that's affecting gravity, must be affecting the strength of springs in the same degree. So I tried the compressibility of liquids. Water will compress—damn little," of course, but it will—and it's changed. It compresses more. So I tried gas. That's unchanged. Pressure of gas depends solely on mass, kinetic energy, and not on intermolecular bonds. There aren't any in gas. The molecules are perfectly free to move about. In solids they're bound so tightly they can't even slide. In water they slide, but can't separate. But they have—a little."

"And the bonds are weakening. That's why springs—solids, of course—haven't the old strength. Molecular bonds are infinitesimally weaker. But the weakening is progressive. But electric and magnetic fields are untouched. So voltmeters read high. Interatomic and intra-atomic forces in general are unchanged, but everything bigger than a single molecule is different."

"I've checked it a thousand ways, Tad. I even repeated Millikan's old measurement of the mass of an electron—which measured the mass by gravitational effect on the oil droplets—and the answer was different. Magnets lift more."

"Great Heaven, Tad, the—the universe will fly to pieces!"

"What will happen?" asked Tad, awestruck now.

"Accidents—horrible accidents here on Earth first. That is so far as we will first detect. The Sun will be retreating. The Moon flying off, too,

you see, because centrifugal force is based only on mass and inertia, and it isn't weakened, but we won't notice that at first. But automobiles—they'll weigh less and less, so they won't fall apart. Men won't notice it, because they'll be getting weaker, too.

"But the inertia of the automobile will remain the same. So when they put on the brakes, the weakened material will crack. And the engines will fly to pieces as the undiminished power of the explosions blows them open. Bridges—lighter, but weaker. The wind will be strong, though. Things blowing up in the air. The air getting thinner, as it escapes against the diminishing gravity—"

"Great Heaven!" said Tad softly. Because he believed now.

The bell rang, and Ban went downstairs and opened the door. Jack Ribby was with him when he came back. He looked curiously at their solemn faces, Ban's dark, scamed face, showing his thirty-five years, but in that ageless way that made him seem eternally thirty-five. Tad Albrite looking younger than his thirty-two.

"What's up, Ban?" asked Ribby.

Swiftly Ban explained the proposition. Ribby's face worked with surprise, and belief from the first second.

"Have you fellows spotted it?" Torrence asked at last.

"Yes, 'fraid of it. Didn't announce it."

"So's everybody else. Both spotted it and been afraid. What did you notice it in?"

"Our Moon first, of course. Then Mercury and Phobos and Deimos. And—Heaven help us—I didn't understand at the time, but the companion of Sirius is bluer to-night than it was a year ago!"

"I thought you said it had no intra-atomic effects; spectra are intra-atomic effects," said Albrite.

"Not in this case. Sirius' companion is so dense, the spectrum is pulled back

toward the red by the intense gravitational field. The gravitational fields are weakening—even so far away as Sirius."

"Why? Why?" demanded Albrite.

THE WORLD asked, too, when it learned; when markets found pound packages of sugar, and butter weighing fifteen ounces. But that was several months later. Before then, the Moon was changed. Earth began to see a smaller Moon, and a different Moon, for as the Moon circled out, the effects were cumulative, and she turned at such a rate that the face which had eternally faced Earth began to turn away, and the unseen face became visible.

And a gold merchant made a small fortune by buying gold in Brazil, using a very accurate type of pneumatic balance, and selling it in the same way in Alaska, where the centrifugal force of the Earth's spin did not cut its weight.

The three men worked together on the problem, and all over Earth other men were seeking some answer, some explanation, and some help. The diminution of weight, starting so slowly, mounted rapidly, cumulative in rate itself.

Ban Torrence did most of the work, using the figures that Ribby brought him, and the apparatus that Albrite designed. 1947 drew to a close, and 1948 began. It was a bitterly cold winter, colder than had been known before for many, many years, despite predictions that it would be a warm one.

It was February when the astronomers definitely announced that, at present rates, the winter would be everlasting, growing neither colder nor warmer, for as the Earth turned its northern hemisphere more toward the Sun, it moved away. But in the southern hemisphere, there would be rapidly increasing cold, as the two effects added, instead of subtracting.

By the last of May and early June,

however, the temperature would start falling again. The report ended with that statement. "By late May or early June the temperature will again begin to fall." That was the end, because there was no other prediction. After June the temperature would fall. In February, the warmest day in New York City registered a temperature of only 42°. The coldest was—19.2°.

And still the world asked why.

The sun rose at seven thirty on March 21st. It rose much later on April 21st, for it was falling behind. Earth was no longer circling it. Earth was spiraling about it.

In late March, the three scientists had moved to Northern Mexico and established a laboratory there. It was easier to work, and much work must be done out of doors.

"Have we got anywhere at all?" Albrite demanded when they had settled again and begun a conference on advances.

"Hum-yes," decided Torrence. He glanced quizzically at Ribby. "You wouldn't believe my statement, so I won't make it. But I'll tell you something. This is about the only warm place on Earth—down in the tropics. We're in the northern hemisphere. Tropic of Cancer to the south of us."

"I still," said Albrite softly, "don't see why you didn't make a job of it and move down to the equator while you were at it."

"It's March right now, and the Sun is actually about over the equator, but it's moving north as usual, so that it'll be over the Tropic of Cancer in June—and that'll be the warmest spot on a very, very, chilly Earth. But what's the difference between the polar and equatorial diameter of the Earth?"

"I don't know—there is a difference, at that. Couple of miles, why?"

"Because the diameter of the Earth through the forty-five-degrees point is the same as the mean diameter. The

poles are flattened. The equator is bulged. When gravity weakens some more, centrifugal force won't—and the thing is going to be even worse. Also—earthquakes. They'll be starting soon."

"Humm—-that's true."

"Well, we're here, what'll we do?"

"Work—and fork fast," replied Torrence. "Ever stop to think, Tad, that we'll have to use some kind of electrical generating equipment in all probability, and that we haven't time to build new, because this weakening is going on so fast that before we could spend the year or so necessary normally, even if we didn't freeze first, to design and build it, it couldn't be built, because all metal would be powder? We have to use standard stuff—and the standard won't be able to stand its own centrifugal force beyond July 30th. So, friend, if we don't find the answer and start in by July to stop it—there—just isn't any use."

"Is there any?" asked Albrite hopelessly. "Trying to do something with the whole solar system?"

"Not," replied Torrence, "with the whole solar system, if my idea is right. And to do anything at all, anyway, we'll have a further little problem to meet, you see. I don't know just yet."

"Then—to work," Ribby sighed. "What must I do? Go on collecting the same old data?"

"With particular emphasis on the new nebular velocities. What's Andromeda now?"

"Minus 12," replied Ribby. "My record so far is minus 22,500. Minus means retreat. The distant constellations are showing some change, too."

IT WAS June 10th. New York City was semideserted. Snow ten feet deep, where it wasn't drifted, blocked all the streets! Where it was drifted, which was almost everywhere, it ran forty and fifty feet deep. The few

people who still lived in New York, less than five hundred thousand, moved about little; only when a boat was due to sail.

Day and night the *crunch-crack-shuff* of the icebreakers in the harbor was audible. Because the temperature had begun to drop in late May. It was -32.4 at noon, June 10th. Where the icebreakers opened the water, it steamed.

The oceans were giving up their age-old horde of heat. Had ice only been heavier, instead of lighter, than water, the temperature would not have fallen so low, for even in the cold of space where Earth was headed now, the stored heat of the oceans would have warmed her for decades.

But ice was forming. The *Atlantic* was in port now, taking aboard passengers at five hundred dollars a head for third class, five thousand for a private room. She was a vast liner, another attempt at the "world's greatest."

And New York heard a rumor. The *Atlantic* was making her last trip—the last trip any ship would make. They were afraid of the waves. They were afraid of the winds. They were most afraid of the ice.

On June 9th there was a blizzard—an antarctic blizzard. The wind howled, and the howl mounted to a shriek. No snow fell, but the powdery stuff rose, thousands of tons of it, swept up by a wind of one-hundred-mile-an-hour velocity, with undiminished force and mass, since its inertia remained. The snow had lost weight. New York was blinded.

At seven a. m. the George Washington Bridge shrieked a new song. The fragments landed nearly a quarter of a mile down the river. At seven thirty, the older bridges failed, the Brooklyn going first. By eight fifteen there were no man-made bridges. But the wind, the snow, had sucked the heat out of the rivers, and the ice had solidified all

across them, so there was a single, great ice bridge.

At ten twenty, the old Woolworth Building crashed, and on its heels came the Empire State tower. The fragments of the Empire State's tower fell over most of southeastern Manhattan.

The blizzard had died by the morning of the tenth, but there were no great towers remaining on the sky line of New York. The weakening of materials, and the titanic force of the wind, had seen to that.

And the rumor that the *Atlantic* would be the last ship to leave New York spread.

The *Atlantic* was booked by dawn of the 10th, and there were no more ships in New York harbor leaving that day, sailing scheduled the next day would not do. A crowd gathered about the sheltered dock of the *Atlantic* on the southern side of Manhattan. A wind still raged at forty-five miles an hour from the north.

SLOWLY the crowd grew, and the low muttering increased. Police and guards kept the lines in check till ten. The *Atlantic* was to sail at noon. At ten ten, the crowd swarmed up her gangways. Guards were killed, crushed. Men, women, and children started up the gangplanks.

Men, and some women, reached the decks and burst into the cabins. Men found and fought their way to the neighborhood of the boiler and engine rooms. At ten twenty, it was estimated there were two thousand people aboard, at ten forty, seven thousand. At eleven o'clock, at least fifteen thousand people, over a thousand tons of humanity, had got aboard.

It was like no other panic crowding. Many of those fifteen thousand were dead already, many more dying. A woman's body trampled underfoot. A girl held erect by the crowd's pressing, blood slowly oozing from her shoulder.

her arm torn completely off, held perhaps in the clenched fingers of her other hand like some monstrous club, dead. A man's dismembered corpse.

For the power of human bodies is supplied by chemical combinations. These were the visible damages, there were shrieks, groans of horrible agony, for the chemical power of muscles remained undiminished, while their tensile strength declined. Literally, people tore themselves apart by the violence of their struggles.

The *Atlantic* gained no more passengers after eleven.

The officers would not sail. They might have sailed for the moment to end the deaths at the wharf, but they could not, for the ship, already filled to capacity, was overloaded. Further, she swayed slowly to the struggles of her passengers.

Then a hold, hitherto undiscovered, was broken open. Instantly a torrent of people poured in, and another five thousand came aboard the ship. A slow, grinding pressure began, and those who, finding themselves in the heated hallways, had stopped, satisfied, and blocked the entrance of more thereby, were gradually driven farther.

The captain ordered the ship to sail. The lines were cast off again, and the ship's great screws turned slowly. No human strength could hold her in now, and she broke free of the crowd at the wharf. But in the harbor, free of the crowd, she stopped again at once. The captain ordered that the crowd be forced off onto the ice shelf that they might walk home. Armed men descended toward them from the bridge.

Half a hundred shots rang out from the crowd. Three guns burst, but the captain and his officers died. The engineer died soon, and his staff was forced to obey the orders from the amateur pilots above.

The *Atlantic* weighed eighty-five thousand tons normally. Her mass re-

mained, and she had more than her normal load aboard her now. The channel had been broken by the ice-breakers, but it was wider than the actual channel, of course. And the amateur pilot had no faintest conception of the handling of an eighty-five-thousand-ton ship.

Things were not normal then. There was a forty-five-mile wind, and the ship was loaded abnormally, she was top-heavy. And she struck a great rock. Normally she would have come to instant rest with a small ten-foot hole in her hull. The amateur pilot had the engines at half speed, and, in desperation, he had thrown them to full speed ahead, as he saw the danger, and tried to cut the wheel as though she were a motor boat.

The *Atlantic's* metal, weakened by the strange force, ripped open for two hundred and ninety-four feet. She sank in fourteen and a half seconds, and rolled on her side, off the ledge of rock, and into the deep water the amateur had almost succeeded in reaching.

Perhaps two thousand might have been saved from the part still unsubmerged. Ships were starting out after them. But the hull sloped, and some slid, for under that howling wind, ice froze in seconds. They fought, and a total of one hundred and seventy-four were saved.

And rumor had been right. The *Atlantic* was the last ship to sail from New York, for her wreck blocked the channel, and the wind howled down from the north all that day and all the next so that no well-equipped salvage ship could cut her out of the way, and for that matter it howled the rest of the days, but that was not important. The ice in the harbor was fourteen feet thick on the morning of the 12th.

London was blocked on the 21st, Baltimore on the 22nd. And the seas of all the world steamed, and the winds, blowing over them, were warned to

some slight extent, so that New York did not have temperatures below -72 until July 3rd, when a northwest gale swept, not from the Atlantic, but all across frozen Canada, and the water in the mains fifty feet below the street froze.

Fire started that day, and ravaged unchecked, till the solid walls of stone and ice it encountered succeeded in damping it, and the wind blew it out again, as it had fanned it before.

Men had learned to be careful by that time, and no one worked even slightly harder than normal. Tens of thousands had died horribly as the automatic muscles of their hearts strained to pump the blood harder—and tore themselves to pieces.

"If," said Tad Albrite desperately, "you don't do something fairly quickly, there won't be any sense in trying. You can't get equipment to do anything in another two weeks."

Ban Torrence looked up bitterly. His eyes were tired and dead. "Will you go away? It's atomic power. I'm after it. If I get it, I can do something, and I won't need so much equipment. If I don't, I won't need any, anyway."

"Atomic power!" gasped Albrite. His voice trailed off as he said it, trailed off into hopelessness. "They've tried for decades."

Torrence motioned toward a massive piece of apparatus on one side of the laboratory. "Almost!" He sighed. "So shut up and let me work."

Albrite rose to look at the thing. Two feet long, a semicylinder. Ruddy copper bars led from it to huge electrolytic condenser banks and a bank of powerful accumulators. And to a further piece of apparatus. Silently he looked at it, then went to the closet, put on his heavy robes, and stepped out into the cold toward the observatory and Jack Ribby.

IT WAS several hours later when he returned. Ban Torrence was fussing with his apparatus again. He looked up at their entrance.

"Hello! I wish you'd look at these blasted circuits again, Ribby, and you, too, Tad. I swear it ought to work. It almost did for a fraction of a second."

"Have you tried it again?" asked Ribby.

"No. 'Fraid it might blow up this time instead of stopping."

"Who cares? Try it," snapped Ribby.

"What ought it to do?" asked Albrite.

"Release atomic energy—not all of it, just smash the atom to parts and collect the energy of the parts. Enough, though, for what we want."

"Try it. We can't lose much," Albrite said. "What are you going to do with the power if it works? How will it help?"

"It will help. I think—I think that Earth and the solar system—just an atom in a greater universe. But they're releasing atomic energy in that greater universe—and we're the atom! If my theory's right, then I can release atomic energy myself and stop their release of *our* energy by just slightly upsetting their field, so that it passes by, harmless. Not a terrific amount of energy needed. The field would spread out from this apparatus here—if it would work—at the speed of light."

"In a second, things would be normal on Earth. In four, the Moon would start coming back. In a few minutes, the Sun's old gravity would be returned, the system balanced. Then the thing would spread till all the universe was reestablished."

"I really slightly invert their energy, so that it destroys itself. It would be a spreading sphere of neutralization, self-propagating, feeding on the thing it destroyed. I would have to add no

more energy to clear all the universe we know of that forge.

"You know—the force is ages old. To that superuniverse, the whole process we've been undergoing for the last months is perhaps a million billionth of a second. The thing has been going on for ages. That is why we have seen distant nebulae rush away—to eternal destruction. The evaporation of their atomic fuel as we felt the first fringes of their power. Now we are in the heart of their release. If I can do this, I suppose they will never know what has happened.

"But I tried the thing, and the blasted thing worked for perhaps a hundredth of a second, just long enough to kick my instruments and show it worked, but not long enough to start that field.

"Shall I try again?"

"I say yes," replied Ribly.

Mute, Tad Albrite nodded.

Ban Torrence walked over to his controls. Slowly, thoughtfully, he set up the switches. For perhaps thirty seconds of silence he waited with the last switch in his hand.

"If this works, we shall be most fortunate——"

His voice was drowned by the sudden titanic discharges rushing into the generator. For scarcely a thousandth of a second it continued before the process, restarted, backed up, and stopped the discharge into it. The generator functioned perfectly.

For an infinitesimal fragment of a second, a strange nausea swept them as the wave of the counterfield drove out, swift as light, into all the universe. Ban Torrence riveted his eyes on the wall clock, the clock that had swung its pendulum with a strange lethargy, as though not interested in keeping up with time. It was ticking suddenly, with a regular, swift stroke.

"Thank Heaven—it works!" said Torrence softly. For a moment his eyes looked toward and through the mass of the machine, crouched in hulked, latent power, the massive conductors leading off in gleaming, ruddy columns. "I wonder," he went on very softly, "if, in some vaster world, they even knew as this particular atom of fuel simply refused to disintegrate."

Then abruptly the scientist in him rebelled. "But why in blazes didn't it work before? I didn't change the thing in the slightest. The same fuel—water—the same generator. Just took it apart and put it back together again exactly as before. I can't see why."

"Was the water pure?" asked Albrite. "Maybe it wasn't—and when you took it apart the drop which caused the trouble was ejected, the generator cleared, and now it will function for another period, until another drop which can't be disintegrated hits it."

"Maybe so; somehow I doubt it. That particular drop simply wouldn't break down. I can't understand why. Just that the generator must have stopped abruptly and could not be restarted till cleared of the charge contained.

"Anyway, it's working perfectly now."

Torrence looked at it, and though he might have told those scientists of a greater world why their machines failed occasionally, since he knew much that they did not, he did not understand all that went on within an atomic generator.

Only he knew that he had restored Earth; that even now she, and her satellite, must be circling toward each other, and toward the Sun; that he had found the secret of vast power that would warm the frozen peoples and power their industry as Earth thawed out once more.



# Riches for Pluto

by Stanton A. Coblentz

*Illustrated by M. Marchioni*

**H**AD THE WORLD only been ready to follow that good old-fashioned motto "Look before you leap!" we might have been spared the dread visitation which descended in

the closing years of the twentieth century.

The terror of the so-called coal maniacs from Pluto, who smote us like a volcanic blast, might not only have been



avoided, but would not have threatened us at all if we had not deliberately invited it. There were, indeed, some who in a remote way foresaw the danger and sought to warn us; but the majority of men, filled with a spirit of adventure, were blinded to the peril by the glamour of a great scientific experiment.

Now that the coal maniacs from Pluto had come and gone, we of the good year 2001 sit back in our chairs and dazedly rub our eyes; it is still hard for us to realize how appalling was the menace from the void. Only an occasional ruined town, a blackened city block, a ravaged engine house or factory, gives proof of the ordeal from which we have recovered.

But let me describe events in their logical succession. As one of those chiefly responsible for the disaster, I have been closely in touch with inside affairs. It was I, Dr. Blandon T. Cragg, of Hoarpeak University, who developed the science of radio-cosmology to its present advanced stage; it was I who, back in 1983, after twenty years of experimentation, produced the now-celebrated ether-amplifying tubes, which magnify the almost inconceivably faint electrical waves from outer space so that they can be heard on an ordinary radio receiver.

And it was I who, in 1986, after elaborate experiments, identified a series of pulsations issuing from remote space and hearing all the earmarks of an organized language. It was not until another two years that their meaning was even approximately ascertained and that they were recognized as issuing from the neighborhood of the planet Pluto; but from that time forth all things moved with astonishing rapidity.

There is no need to recount by what elaborate processes of analysis we measured and interpreted the now-famous Roentgen-Gartner rays, those peculiar Plutonic emanations—emanations which communicated themselves to a television

screen, to form pictures and patterns, many of which were easily translatable. Since the facts are now available in any scientific textbook, I shall pass on to remind the reader what a storm was created by the first cautious revelation of the new knowledge.

For a long while there were millions who could not believe that Pluto, that dark speck of a planet revolving far beyond the orbit of Neptune, was actually the abode of intelligent life. Yet such was the undeniable truth. We had not only received the television messages, but had transmitted messages of our own, which had been answered with pertinency and directness. And the burden of them all was that the natives of Pluto were a wise, venerable, and progressive folk, who had been cultured when our own forebears were hopping among the trees.

Had we been content to remain merely on a plane of cordial interchange with the Plutonians, all would have been well. At the distance of several thousand million miles, they could have done us no damage, even if our curiosity had remained unsatisfied. But, alas, we listened with too open an ear, and our instinct of self-protection seemed to be in abeyance!

How slow we were in sensing the danger when the Plutonians, having exchanged scores of messages with us and being on the best of good-neighborly terms, gingerly invited themselves to visit the Earth! Yes, visit the Earth. The first extramundane beings ever to alight on our planet. Here, certainly, was a proposition to bewilder, to dazzle, to allure.

The peculiar part of the matter, however, was that our consent and coöperation were desired if the Plutonians were to reach the Earth. It was for us to decide if they were to come.

LET IT NOT be supposed that they would have asked consent if they had

known how to arrive unassisted. They were not—as we afterward learned—precisely sticklers over fine points of interplanetary etiquette. But, as they themselves frankly explained, our aid was necessary.

Members of their race had been able, unassisted, to reach some of the nearer and larger planets, including Neptune, Uranus, and Saturn; but their most experienced space travelers, in several ill-fated attempts to make Mars and our own world, had missed their bearings and plunged headlong into the Sun. Hence it was believed that, in order to succeed on their first Earthly voyage, they must have the guidance of electrical signals from our planet. On later expeditions, doubtless, they would be able to find their way for themselves.

To give the required help would be simple enough—but should we do so? There were very few who felt we should not. Personally, as a leading backer of the undertaking, I was vehemently enthusiastic; it seemed to me that here was an epoch-making scientific opportunity and that the arrival of the Plutonians would mark an anniversary in the annals of science. And it was clear that the vast majority shared my view.

Due to unavoidable delays, it was not until September, '93, that the historic acceptance proclamation was radioed to Pluto; the official announcement of our willingness to cooperate in the movements of a space car bearing twenty Plutonians Earthward.

It must be admitted that, owing to certain defects in communication, we were still much in doubt as to the nature of the Plutonians. Their physical features were known to us, but only in part; the television screen had shown them as lean, human-shaped beings, with huge mouths, and bony, cone-shaped heads bearing eyes both in front and in the rear; but there was no way of determining their relative size, and we were long to be in doubt whether they were

giants or pygmies, whether they were dark-skinned or light, whether they were personally puny or powerful.

But such little mysteries only added pungency to the waiting. Could we have guessed the facts, we might have been less eager for their arrival.

The delay was, indeed, much more prolonged than we could have desired; for the Plutonians, being in no hurry about completing their preparations, were not ready to leave until December '96. Then it was that, amid world-wide acclaim, the news was flashed abroad that the interspatial travelers were on their way. Flying through the outer solar system at a speed often exceeding one hundred miles a second, they were journeying directly to Earth.

Even so, it would be well over a year before they could arrive, and meanwhile we must curb our impatience while exchanging daily radio messages with the space car.

WHO OF the survivors of the subsequent disturbances will ever forget the evening of the 18th of March, '98? Then it was that the strangers, already visible for several days through powerful lenses, were to descend at a great airport near Washington—the official guests of the American government. Despite all edicts designed to restrain public enthusiasm, a crowd of several hundred thousand space fans had gathered in the fields and woods adjoining the airport; and vast was their excitement when, just after sunset, a shining elliptical object was detected far off in the eastern heavens.

"There they are! There they are! See them! Right on schedule!" cried the multitude, in irrepressible joy; and thousands grew hoarse with shouting as the object gradually drew nearer, descending in a series of long spirals at a speed equal to that of a crack transatlantic flier. Not much could be determined regarding the space car, except

that it was larger than the largest airship and shimmered beautifully with a light like that of sun-reflecting silver clouds.

But we were, of course, less interested in the vessel than in its occupants; and, as it gradually settled to Earth, we could hardly restrain our eagerness.

Yet I must admit that I, as I sat in the special stand marked "Reception Committee," felt just a shudder upon watching the great elliptical object twisting and maneuvering like a living thing as it made its way to Earth. I do not know why, but suddenly a dark veil descended before my eyes; I felt faint and cold, and an uncanny shivery sensation settled to the very pit of my spine.

But doubtless this was due to my excitement. After a moment, the mood of strangeness passed away, and I was quite myself again as I arose, in company with the President of the United States, the Secretary of State, and the Speaker of the House, in order to extend an official welcome to the visitors.

The time seemed never-ending, though actually but a few minutes had passed, before the space ship came to a halt in the center of the airport. Undeterred by a chilly wind from a long pipeline vent in the rear, the members of the committee all stepped forward unhesitatingly, while the air was filled with the yells and howls of innumerable onlookers.

Solemnly we approached to within a hundred yards of the elliptical car, which rose enormous above us, tall as a five-story building; then, a little nervously, we stood at a designated spot and waited.

And, while we waited, one of the walls of the space car seemed to move outward to meet us; a partition fully fifteen feet wide and thirty feet high swung toward us like a door, and in the opening we caught our first glimpse of a Plutonian.

IT IS little wonder if we gaped and started back, seized by sudden fear. It is little wonder if the President lost his dignity and gave such a jerk that his high silk hat was knocked to the ground.

For who of us ever pictured the Plutonians in their astonishing reality? To begin with, they were each as high as five men, piled one on top of another. But more unearthly still was the color of their skin; white, an absolute white, not pinkish like the skins of Nordics, but a bloodless snowy white that gave them a ghostly appearance.

This, as was later explained, was due to the scantiness of the sunlight on their planet. But at the moment I did not pause to analyze the reason. Rather, I noted certain other facts with amazement—that the newcomers wore no clothes, but went stark-naked in their hairless albino skins; that their two pairs of eyes, dominating the back of their heads no less than the front, were covered with heavy bluish glasses, no doubt to protect them from the intense terrestrial sunlight; and that enormous rubberlike tubes, entering through slits in their chests, were connected with barrel-sized tanks slung about their shoulders. These, as we subsequently found, represented artificial breathing devices; but the first impression they gave was of something monstrous, something nightmare-terrible.

It was astonishing how rapidly the crowds had melted away. Many hundreds, it was afterward learned, were hurt in the stampede to escape; not five minutes had passed before all that was left of the multitude was represented by an occasional wary watcher, peeping from behind a boulder or tree trunk.

The reception committee, however, remained faithful to its allotted function. Though our President was trembling so violently that he had to lean upon the Secretary of State for support, all of us stanchly faced the Plutonians, hoping against hope that

they might be less horrible than they looked.

Our misgivings, indeed, did not seem to be justified. The first Plutonian, upon catching sight of us, instantly let forth a ringing howl that had in it more of surprise than of menace, and then bent double in a paroxysm of laughter.

And several of his comrades, following him out of the car, took one glance at us, then laughed with equal abandon.

Of course, the President, the Secretary of State, and the rest of us felt affronted; for we all, being clad in our official best, with full-dress suits, black silk hats, and canes, could not understand what these naked strangers considered amusing about us.

However, suppressing our indignation, we did our best, by means of signs and gestures, to let them understand that they were welcome; and they, catching our meaning, replied amicably enough, although we still had the irritating sense that they were secretly laughing.

IF WE HAD entertained any misgivings upon first seeing the Plutonians, our minds were quickly put at rest. After the embarrassment of the original meeting, the strangers showed themselves the height of friendliness; they expressed a sincere pleasure at being with us, and, despite their great size, did not show any inclination to treat us other than as equals.

True, they did cause us many difficulties; there was the problem of feeding them, which was not helped by the fact that, weighing eight or nine tons each, they could consume an ox apiece daily; there was the question of housing them, which was only solved by removing the side of a huge warehouse and equipping it with specially made furniture of Brobdingnagian size.

There was the matter of clothing them, which was never solved at all, since they were proud of their nakedness, and steadily refused to "humiliate

themselves with our barbarian wrappings;" and there was the difficulty of walking safely in their presence, for every now and then they stepped upon some person inadvertently, crushing him as we might crush a beetle.

Aside from these details, however, we managed exceedingly well. Before a month had gone by, the coming of the Plutonians was pronounced a huge success; it was generally agreed that never had we encountered a more highly cultured, civilized and likable folk.

But alas! I am little inclined to dwell upon the accomplishments of the Plutonians. Let others devote space to such things as their artificial breathing system, which enabled them to exist in the atmosphere of any planet; their production of power from starlight; their synthetic creation of protoplasm; their invention of heatless light; and all the other marvels of their science.

In my estimation, as in that of most men, all these marvels are overshadowed by their one great, their deplorable, their fatal failing—that failing which turned their visit here from a triumph to a catastrophe.

Only about a month after their arrival, the eruption occurred. I well remember the occasion. I was walking with two of the strangers down Pennsylvania Avenue, in Washington, and a considerable crowd, attracted by the sight of the giants, had formed to our rear.

All street traffic, naturally, had detoured to make room for us; and as we proceeded on our way, the Plutonians ambling at their most lazy pace while I panted in my haste to keep up with them, I reflected that perhaps after all there were disadvantages in having friends from other worlds. Then all at once I stopped short, noticing that a peculiar change had overcome my companions.

Both of them had halted; and, with avid eyes glaring with peculiar greenish

and violent fires, were regarding what seemed to me the most commonplace of sights—a heap of coal, piled in front of an apartment house.

Then, in one voice, they both cried something that sounded like "Bobo, bobo!" and hurled themselves upon the coal.

A moment later, they had come away with huge armfuls of the black mineral, which they hugged to themselves as mothers might hug their long-lost babes, while gibbering incomprehensibly "Bobo, bobo, bobo!"

As ill luck would have it, half a dozen more Plutonians were promenading only a block away; and, hearing the commotion, they dashed to the scene with the speed of an airplane, not noticing that twenty lives were stamped out in their hurry.

They, too, upon seeing the coal, uttered those excited cries of, "Bobo, bobo, bobo!", and plunging into what was left of the coal, seized it by great chunks, which they clutched with possessive fury.

It was strange to see how the snowy-white skins of the Plutonians had been suddenly smudged with black. And stranger still it was to watch how two of the giants fought and wrestled, with a heaving of great muscles and a gnashing of teeth, as they strove to secure possession of a particularly large mass of coal.

"Bobo, bobo, bobo!" the Plutonians still cried frenziedly, and it was easy to see that they had all gone mad.

Yes, mad; stark, raving mad! That is my only explanation. They were like men who, sane in all things but one, are suddenly under the delusion that water is wine or sand is gold. And henceforth we were treated to an unending round of criminal lunacy.

In the Plutonians' view, doubtless, it was not lunacy, nor was it criminal; for, as they explained during their calmer moments, coal is the most rare of min-

erals on their planet, only a few hundred tons of it having ever been discovered. Being rare, it is highly valued, and is used not only in the more costly types of jewelry, but as the universal medium of exchange.

Imagine, then, the elation of our visitors! They were in the presence of inestimable riches! They might return home as multimillionaires.

TO ME, I must admit, it was a saddening spectacle that a race otherwise so enlightened as the Plutonians should fall prey to so gross a superstition. But there was apparently no power on Earth that could check their rapacity. Their greed for coal was insatiable, and within a few days had become a menace to our planets.

Evidently their sole object now was to pack their space ship to the brim with "bobo," and, thus treasure-laden, to return to their own world. They would not listen to reason; they paused at nothing in their lust for the black fuel; they roamed our cities like fends, looting coal yards, demolishing basements, smashing locomotive tenders, and snatching coal even from the furnaces of factories and ships.

Worst of all, when they did not cause damage directly by their thievery, they caused it indirectly by their quarrels among themselves. By means of a crescent-shaped organ attached to their shoulders, they were able to flash tremendous green electrical bolts through the air, stunning one another in their bull-like encounters; while any unfortunate human struck by one of the bolts would be instantly electrocuted.

As a result, the streets of many towns came to resemble a battle zone with their multitudes of unburied corpses, buildings everywhere were charred and blasted; and the citizens of our great Eastern cities, fearing for their lives, were driven underground like rats, groping in starvation and terror while the

coal seekers mercilessly raged the Earth.

Then had the world done nothing to protect itself? Had we not sought to rid ourselves of our visitors? It is well-known that we had done all we could. With a spirit of rare self-sacrifice, thousands of our youth set out to combat the Plutonians, but as successfully could a minnow resist a shark.

Equipped with superior sense organs, equipped with eyes that saw both forward and backward, equipped with death-dealing lightnings, which they could aim with fateful accuracy over distances of scores of miles, the Plutonians were impregnable against our weapons.

They would demolish a gun before the bearer could lift it to his shoulder; they would dismantle a piece of field artillery by a lightning blast before even a shot could be fired; they would destroy airplanes sent to drop bombs and would discover and explode dynamite mines planted to trap them. Apparently they were unapproachable! And meantime their depredations continued unabated.

Hence for a time it seemed as if they were to overwhelm and wreck civilization.

"But wait a bit! Only wait!" some of the more optimistic of our number exclaimed. "The visitors will fill their space car with coal, they will depart for Pluto, and that will be the last we shall ever hear of them."

"Do not believe so!" others would point out. "When they return to Pluto, that planet will go wild with the news of the discovery. They will start a great coal rush to the Earth! Now that we have shown them the way here, they will be able to come without our aid. We shall be overrun by thousands of coal maniacs! There will be no defense against them—we shall be wiped from the face of the Earth!"

Most of us, on hearing this prediction, merely nodded dismally.

But what could we do to save ourselves? Once the Plutonians regained their own planet, we were doomed. And how prevent their return?

Now, of course, our efforts centered about the space car. If this could be destroyed, our visitors would be trapped on Earth.

But the Plutonians, as if surmising our intention, placed a guard of five about the shining elliptical space vessel. And thus all assaults upon it by airplane and siege gun were frustrated, and all the assailants slain; while our only reward was a mocking round of Plutonian laughter.

IT WAS in January, 1999, that the red turmoil first seemed to be drawing to a close. Then it was that our visitors, as if regaining some measure of sanity, saw fit to send us their first message in months. By means of radio and television, we caught the following communication:

"Friends of the Earth, we prepare to leave! We have stored away all the treasure our car will hold. But we shall be back! We shall be back, never fear, and bring others of our kind. If we have caused you any inconvenience or loss of life we are sorry, but what, after all, are a few lives compared with our great gain?"

Then, after a pause, the message continued:

"On our return voyage, we must take two members of your race, O Earth-men, to exhibit to our brothers as specimens of the hairy pygmies of your planet. You must select the fortunate individuals, O Earth-men, and on the third day from now you must convey them and their baggage to our space car."

Needless to say, it was with mixed emotions that we received this message. That the Plutonians were at last to depart was cause for rejoicing; but that they were to return, with others of their

kind, was confirmation of our worst suspicions. And was there still nothing we could do to save ourselves?

It must be admitted that at first no practicable idea occurred to any one. It was only after two days that a scheme, as forlorn and daring and heroic as any ever sprung of the mind of man, took form in the brains of two Kentucky youths. Arnold and Clayton Westfall they were called—names that will be honored as long as valiant deeds have any place in the memory of man.

By special airplane, they rushed to see the government heads, who were in exile at Cincinnati; and, after a secret conference, it was proclaimed that they were to be the two delegates to Pluto. But little a listening world understood how much was implied by this announcement.

What happened on the following day is well-known, and probably never will be forgotten so long as there are men to recall it. Looking pale and drawn, but with teeth set in grim determination, the Westfall brothers were officially driven to the doors of the Plutonian space car.

Three of the white giants were in waiting to receive them, and expressed no suspicion at seeing the huge tanks which accompanied them as their "baggage." The largest of these, it was freely admitted, contained oxygen, lest the breathing conditions on Pluto prove unsalubrious; while the smaller and heavier tanks were declared to be filled with distilled water for the voyage.

Owing to the recent depopulation of the countryside, there were but few witnesses that evening when the car, with its twenty giants and two human occupants, slowly arose in air above the ruined towers of Washington. The first stage of the journey was accomplished by means of electrical motors, and it was not until after leaving the Earth's atmosphere that the more

powerful method of rocket propulsion was to be employed.

Hence the machine moved with the graceful precision of a Zeppelin, and nearly half an hour had passed before its silvery elliptical shape had climbed five or six thousand feet.

Then it was that, all at once, onlookers for scores of miles were treated to the sight of a blazing apparition. A tiny crimson glow, appearing suddenly at one corner of the elliptical object, grew with spectacular rapidity, until in a moment the space car was a lurid red mass which swayed on its upward course, writhed and tossed in space like an agonized living thing, and then precipitately began to fall.

Down, down, down, larger and larger, glaring enormously amid darting draperies of orange-and-scarlet flame, the whole great mass shot Earthward like a ruined world, and, hissing its death screech, sank to rest in the waters of the Potomac.

ON THE following day, while men still rubbed their eyes in a daze of astonished relief, the official explanation was made. Contrary to previous statements, Arnold and Clayton Westfall had not carried water in the heavier tanks; they had borne benzine—a liquid of whose nature the Plutonians were ignorant.

This—assuming that they followed their prearranged plan—they had secretly spread over the stolen coal; then, after releasing the oxygen from the tanks, they had set a match to the entire mass, with the result that the Plutonians' ill-gotten riches had become their own funeral pyre.

The two volunteers, of course, were themselves destroyed in the conflagration; but the world, in honoring their memory, will long be grateful to them for the heroism that rescued our planet from the coal mania of Pluto.



*In the depths of the crystal was an image of the third world.*



# OLD FAITHFUL

*A novelette of the problem of communication—heroically and tragically solved*

by Raymond Z. Gallun

*Illustrated by Elliot Dold*

IF NUMBER 774 had been a human being, he might have cursed bitterly or he might have wept. Certainly he had reason to do so. But Number 774 was not a human being. His fragile form bore not the slightest resemblance to that of a man; he knew nothing of smiles or frowns or tears, and whatever emotions passed within his cool, keen mind were hidden even to members of his own race.

The two messengers who had come to his workshop that afternoon had not seen into his heart, and he received their message with the absolute outward calm that was characteristic of his kind—at the end of forty days Number 774 must die. He had lived the allotted span fixed by the Rulers.

With food and water as scarce as they were, no one had the right to live longer unless he had proved through the usefulness of his achievements that it was for the good of all that he be granted an extension. Otherwise the young and strong must always replace the old and weak.

In the opinion of the Rulers the work of Number 774 was not useful; it was without value and was even wasteful. An extension of life-span could not be considered; Number 774 must die.

Having imparted this information the messengers had crept into the streamlined hull of their ornithopter. Silvery wings had flapped, and the weird craft had lifted lightly, circled the great isolated workshop once in parting

salute, and then had sped off into the west toward a distant city.

In obedience to some impulse Number 774 had ascended to a high-placed window in the towering wall of his domicile, to watch the ornithopter go. But long after the glinting metallic speck of its form had vanished into the sunset, Number 774 continued to stare out toward the west. Pools of purple shade swelled and broadened in the hollows between the dunes of the Martian desert that stretched in undulating flatness to the far horizon.

The Sun sank out of sight, leaving only a faint reddish glow that quickly faded out at the rim of the world. The Martian sky, deep purple and shot with stars even during the day, became almost black, and the stars, veiled by an atmosphere only one sixth as dense as that of Earth, gleamed with a steady and eerie brilliance that is never seen by terrestrial observers.

It was a strange, beautiful sight, and perhaps in other circumstances something fine and paradoxically human in Number 774's being might have appreciated its wild and lonely grandeur. But natural splendors could scarcely have interested him now, for his mind was too full of other things.

In the sky was a tiny gray-green streak which he knew marked the position of an approaching comet. For a long moment he stared at it; and then his gaze wandered up among the welter of stars and sought out a greenish-silver

speck far brighter than any of its fellows.

For many minutes his attention clung unwavering to that brilliant point of light. He knew more about that planet than any other inhabitant of Mars. He had never heard its name, nor in fact did he have a vocal name of his own for it. To him it was just the world which held the third orbital position in order from the Sun. And yet, for him, there was concentrated in it all the hopes and all the fascination of a lifetime of painstaking work and effort.

Gradually, by patient, methodical observation, he had wrested a few of its secrets from it. He had learned the composition of its atmosphere; he could describe its climates accurately; he even knew something about its soil. But beyond such superficial information for a long time it seemed that he could never go.

And then one night when, with stoical resignation, he had all but laid aside his fondest dream, a sign had come. The third planet, Earth, was inhabited by thinking beings. It was not a spectacular sign; neither was his conclusion guesswork. Number 774's telescope had revealed, on the darkened side of Earth, between the limbs of its crescent, a barely discernible flicker of light flashes, evenly spaced, and repeated at perfectly regular intervals. Only a high order of intelligence could have produced such signals.

**DOMINATED** by a new zeal, Number 774 had constructed a gigantic apparatus and had duplicated the Earthian signals flash for flash. Immediately he had been answered. Then he had tried a new arrangement of flashes, and the unknown beings on Planet Three had seen, for they had repeated his signals perfectly.

For five Martian years, the equivalent of nearly ten passages of the Earth around the Sun, he and the unimagin-

able entities on that other world, hardly ever less than thirty-five million miles away, had labored on the colossal problem of intelligent communication.

The results of their efforts had been small and discouraging; yet in ten or twenty years even that gigantic enigma might have yielded to persistence, ingenuity, and the indomitable will to do. But now no such thing could be. In forty days Number 774 would no longer exist. Nor would there be another to carry on his work.

Study of the third world could not produce more food or make water more plentiful. The Rulers would dismantle all the marvelous equipment that he had assembled to aid him in his quest for useless and impractical knowledge. The veil of mystery would remain drawn over Planet Three for many thousands of years, perhaps forever.

But it was the Rulers' privilege to command and to expect unquestioning obedience. Never once in a millennium had their authority been disputed; for the very existence of the dominant race of Mars, a world aged almost to the limit of its ability to support life, depended on absolute Spartan loyalty and discipline. Revolt now was unheard-of; it could not be.

Did Number 774 feel resentment over his fate? Or did he accept his sentence with the stoicism of a true child of Mars? There was no way of telling. His position was almost unduplicated in the annals of the Red Planet, and, in consequence, his reactions may have been out of the ordinary. Almost never before had a creature of his kind wandered so far along the road of impractical knowledge, or had received the notice of the termination of life-span so inopportunistically.

And so Number 774 continued to gaze up at the green star that had been included in every dream and effort of its existence. Thoughts and feelings

must have tumbled in riotous confusion inside his brain.

After a while Phobos, the nearer Moon, mounted up over the western\* horizon and began its rapid march among the stars. Its pallid radiance converted everything into a half-seen fairyland of tarnished silver and ebony, the dunes of the lonely desert extending mile on mile in every direction, the low, forlorn walls of Number 774's workshop, the great shining dome of metal that capped it. Nothing was clearly discernible, nothing seemed real.

The coming of Phobos aroused Number 774 from his lethargy. It may be that he realized that time was fleeting, and that an hour could ill be spared from the forty days of life that still remained to him. At a deft touch the crystal pane that glazed the window before him slipped aside, and a faint night breeze, acid, and chilled far below zero, blew in upon him.

Edging his strange form forward, he leaned far out of the window and seemed intent upon creeping headlong down the rough stone wall. Long slender portions of his anatomy clutched the sill, and he hung inverted like a roosting bat of Earth. But otherwise there was not the remotest resemblance between Number 774 and a winged terrestrial mammal.

If, by means of some miraculous transition, an Earthman had suddenly found himself standing there on the desert and looking up at the wall of the workshop close above, he might not even have recognized Number 774 as a living creature in the shifting, uncertain moonlight. Amid the fantastic jumble of light and shade he would have seen only a blob of rusty brown color that might have been just the distorted shadow of one of the stone projections that jutted from the wall.

If he had looked closer he might have believed that the thing he saw was a small bundle of ancient and rotten rags dangling from the window ledge, with long, loose tatters stirring idly in the faint breeze. Still, the glint of bright metal from Number 774's equipment would have puzzled him, and perhaps his flesh would have tingled slightly at the suggestively gruesome aspect of this unknown and poorly illuminated object.

From his dangling position Number 774 sucked a great breath of cold air into his complex breathing organs. The frigid tang of the night refreshed him and seemed to endow him with new life. One last glance he cast toward the glory of the Martian heavens. At sight of Earth and the threadlike speck of the comet, his great eyes, dark and limpid and more nearly human than anything else about him, flashed briefly with a vague, slumberous suggestion of something pent up behind a barrier that was none too strong to hold it back. Then Number 774 drew himself up into the window.

Three jointed rods of metal unfolded themselves from the complicated arrangement of mechanisms that was fastened to his fragile body, and in a moment he was striding along on them like a man, down a green-lighted cylindrical passage that extended off into misty obscurity. A faint and regular clicking came from the device, but Number 774 did not hear it. He knew of sound only as a vibration detectable by his keen sense of touch, and as a phenomenon registered by his scientific instruments, for Number 774 had no organs of hearing.

His steps seemed hurried and feverish. Perhaps some un-Martian plan was already half formulated in his restless and troubled mind.

\* Mars rotates on its axis in 24 hours, 37 minutes, 22.67 seconds. Phobos, the nearer Moon, which is only 3,700 miles distant from Mars, completes its orbit in only 7 hours, 39 minutes, thus overtaking its primary more than three times in every Martian day. Since Phobos follows its path in the same direction that the planet rotates, it is evident that to an observer on Mars, it would appear to rise in the west and set in the east.

THE TUNNEL debouched at last into a colossal chamber where gigantic flying buttresses swept up and up through a misty green glow to meet the sides of an enormous rotunda of white metal that roofed the room.

Enigmatic forms of weird apparatus crowded in bewildering complexity against the walls. Tipped at a steep angle at the center of the floor was a vast cylinder of webby girders. Piercing the dome, opposite the upper end of the cylinder, was a circular opening through which a portion of the starlit sky was visible; and at the base of the cylinder a great bowl rotated rapidly, like a huge wheel.

Here was the observatory of Number 774, housing his telescope, and here were the controlling mechanisms of his signaling apparatus. He hurried up a steep ramp, from the upper end of which he could look down into the interior of the great rotating bowl. His eyes glanced critically over the device, searching for any possible slight disorder in its function. But there was none.

To an Earthman acquainted with astronomical equipment, the purpose of the rotating bowl would have been at once apparent, and he would have marveled at the simple cleverness of this piece of Martian ingenuity.

The bowl contained mercury. As the container spun on its perfectly balanced axis, centrifugal force caused the mercury to spread in a thin, precisely distributed layer over the inside of the bowl, forming a convex surface that acted admirably as a mirror for Number 774's gigantic reflecting telescope. Its area, and its consequent light-collecting capacity, was many times greater than any rigid mirror that could have been constructed without flaws.

Satisfied with his inspection, Number 774 hoisted himself nimbly to a small platform, high-placed among the spidery girders of the chamber. His move-

ments were quick and catlike, yet coolly efficient, and he seemed bent upon making use of every moment of life that remained to him.

His eyes almost lambent with eagerness, he stared into the large crystal sphere which the platform supported. From a prismatic arrangement fixed to the telescope arrangement above, an invisible beam of light came down, impinging on the sphere, and causing the picture which Number 774 was so intent upon to appear.

In the depths of the crystal was an image of the third world, Earth. Since it was to Sunward and nearing inferior conjunction with Mars, most of its surface that was turned to the Red Planet was in shadow and could not be seen. Only a thin curve of light fringed one hemisphere.

Visible in the crescent were mottled areas of gray and green and brown, which Number 774 knew were oceans, continents, deserts, and verdant countryside. The shifting blurs of clouds, the winding rivers, and the snow-capped mountain chains, he could recognize and understand, too; but there was so much that distance and the distorting effects of two atmospheres left hidden and seemingly unattainable—things about which he had longed so passionately to see and to know.

A delicate bundle of pink filaments that terminated one of Number 774's stalklike limbs rested on a tiny lever before him. The threadlike tentacles, marvelously adapted and trained for the finest and most accurate sort of work, moved the lever slightly to the right.

Immediately there was responding movement in the heavy parts of the huge telescope, and the image of Planet Three in the crystal globe began to grow. Mountains loomed larger; seas and continents swelled until the whole of the image of the terrestrial sphere could not occupy the globe, and all that

could be seen was a small part of the illuminated crescent.

For a while, as the increase in magnification went on, details on Planet Three were brought more clearly into view; but presently, as the picture grew larger and larger, it began to tremble and to undulate, as if it was seen through a million atmospheric heat waves.

As the power of the telescope was increased still further, the flickering, jumping, shifting luminescence that appeared in the vision-globe became totally incoherent and meaningless and bore no slight relationship to an Earthly scene. Number 774's huge optical instrument was failing before one of the same obstacles to magnification that terrestrial observers have noted in their telescopes:

The gaseous envelopes of Earth and Mars, with their countless irregular air currents and varying indices of refraction due to differences in temperature and humidity, were distorting the image-bearing rays of light coming from Earth across fifty million miles of space and rendering magnification beyond a certain point useless. The telescope of Number 774 still had many Martian units of magnification in reserve, but for probing into the mysteries of Planet Three that reserve was of not the least value.

Still, Number 774 often gave his instrument full power in the vain hope, perhaps, that some day, by some trick of fate, the atmospheres of the two worlds would be quiet enough and clear enough to give him a momentary glimpse into the unknown. But the opportunity for such a glimpse had never come.

Cool and collected, Number 774 brought his telescope back to the limit of effective magnification. In response to the manipulation of some instrument the image of Planet Three shifted so that no portion of the crescent was visible. The crystal globe was dark, but

Number 774 knew that the third world was within the field of view.

UNERRINGLY, guided by his instruments, he fixed his telescope on a certain spot on the dark side of Planet Three. He knew that shrouded in the shadows of the night hemisphere of that distant world there was a great continent extending broad and diversified, between two vast oceans. It had lofty ranges of snow-crowned mountains, extensive plains, green with an unknown vegetation, great lakes, and winding rivers. In the southwestern portion of that continent was a desert, and near the edge of that desert was the Place of the Light—the light that was the voice of the friend he had never seen, and whose form was unimaginable to him, much though he might imagine and long to know.

The Light was not there now; only the vague, white blurs of Earthly cities dotting the darkened continent, adding the mystery of their existence to the enigma of Planet Three. But Number 774 was not troubled by the absence of the Light, for he had faith in it. When he had signaled, it had always appeared in answer; it would appear this time, too.

At his touch a vast mechanism in a room far beneath the chamber of the telescope began to function silently and efficiently, building up power. Feeble and delicate and hideous though Number 774 was, by Earthly standards, at a mere gesture he could evoke forces that were worthy of the gods.

Number 774 watched a Martian version of a potentiometer. It was not like a terrestrial potentiometer. It had no graduated scale, no nervous pointer. It was just a globe of something that looked like frosted glass, from which a soft luminescence proceeded.

First, Number 774 saw in its depths a slumberous glow of a beautiful shade, quite unknown and unrecable to human

eyes. It was what is called infra-red on Earth. The color, being invisible to men, was of course quite indescribable, but to Number 774 it was as common as blue or yellow, for his eyes, like the eyes of some of the lower forms of Earth, were constructed to see it.

In addition, like all Martians, he was able to distinguish the slightest difference between one shade of color and another.

It is upon this fact that Martians depend for the accurate reading of, instruments which, among men, would ordinarily have pointers and graduated scales. In any Martian meter, infra-red, and of course the various shades of infra-red, in their order of appearance in the spectrum, means a low reading.

Red, and the shades of red, advancing toward orange, constitute somewhat higher readings. Orange, yellow, green, blue, and violet are progressively higher; while the shade at the extreme outer end of the ultra-violet band, which Martian eyes can also see, represents the highest reading.

In short, light of various wave lengths is used in practically all Martian meters to designate readings. Low readings are represented by long wave lengths near the infra-red end of the spectrum; while high readings are designated by short wave lengths of light near the ultra-violet end of the spectrum.

Number 774 waited until the changing kaleidoscope of ordinary colors had passed, and the delicate hue of ultra-violet had reached its maximum in the globe of the potentiometer, before he made any further move. Then his tense body swayed forward, closing a complicated switch.

The result was instantaneous. Through the circular opening in the rotunda, at which the muzzle of the telescope was pointed, a dazzling blaze of incandescence was visible in a sudden

tremendous flash. The detonation that accompanied it was of a magnitude which one would have scarcely believed the rarefied atmosphere of old Mars capable of transmitting. The whole building, solidly constructed though it was, trembled with the concussion.

For a moment the Martian night, within a radius of twenty miles or more of Number 774's workshop, became brighter than midday, as an enormous store of energy, released from the outer surface of the metal dome which capped the observatory, poured suddenly into the atmosphere, thus forming above the workshop a vast canopy of cold light, far more intense than any aurora borealis of Earth.

But the sudden flare died out as quickly as it had come; the echoes of the crash faded, and the calm of lonely desert and stars reasserted itself. Some eerie monster, which had unwittingly buried itself in the sand too close to the lair of Number 774, scrambled out of its warm sleeping place amid a cloud of dust and on gauzy wings sped hurriedly away from the zone of the thunder that had terrified it. As it flew, its fantastic shadow bobbed crazily over the moonlit sand.

But Number 774 was quite oblivious of any fears his experiments might arouse in the creatures of Mars. As far as his mind was concerned, for the time being things Martian had almost ceased to exist for him. Earth, Planet Three, claimed all his attention, and there was room for nothing else. He had given his sign; now he would wait for the answer that was sure to come.

It would take approximately nine minutes for Earth to get signals back to him. For that was the time which light, traveling at a speed of 186,000 miles per second, required to bridge twice the fifty-million-mile void lying between the two planets.

Number 774's weird, fragile body hunched eagerly forward on the small

mat on which he squatted. His great eyes burned with the same fire of fascination which they had held, when, a little while ago, he had gazed up at Earth and the approaching comet from the window in the wall of his workshop. Unwaveringly they were fixed on the spot in the darkened vision-globe where the Light would appear.

Sometimes that light was too dim for his trained and sensitive eyes to see; but arranged and hooded on a carefully shaded portion of the vision-globe was a Martian photo-electric cell which would pick up the faintest of light signals and convert them into electrical impulses which would be amplified and relayed to an instrument close beside Number 774.

This instrument would reproduce the signals just as they came from Earth, but bright enough to be easily watched. Another device would record each flash for later study.

## II.

THE BODY of Number 774 tensed suddenly. There was the first signal, flickering faint and feeble across the millions of miles of space; yet on the desert of Earth it doubtless represented flashes almost comparable with those which Number 774's powerful sending equipment produced.

Number 774 could barely see them in his vision-globe, but the little glass bulb of the reproducing apparatus flickered them out plain and clear—long flashes, short flashes, representing the dots and dashes of the Morse code of Earth.

Flash—flash—flash—flash—

"Hello, Mars! Hello, Mars! Hello, Mars! Earth calling. Earth calling. Earth calling," the message spelled, and Number 774 was grimly in the midst of the colossal task he had set for himself.

Lurking in the back of his mind was the realization that his death was decreed, and that soon, unless something

unprecedented happened, all this work of his, and of his friend of the Light, must end, unfinished, before the intelligences of two worlds could really meet and exchange ideas freely. But it did not divert him or make his attention to the task in hand less keen. In fact it seemed to sharpen his wits and to add pressure to his determination.

Still, his mind seemed divided into two parts, one of which was cool and logical and scientific; the other in a turmoil, fighting with itself and its loyalty to time-honored traditions.

"Hello, Mars! Hello, Mars! Earth calling. Man of Mars is late—late—late—late— One, two, three, four, five, six, seven, eight, nine, ten. Four and five are nine. Two times three is six. Man of Mars is late—late—late—late—"

How much of this queer jangle of light flashes, spelling out Earth words and numbers in the Morse code, did Number 774 understand? How much could he understand?

Intelligent comprehension of anything new is almost always based on an understanding of similar things previously in the experience of the individual in question. The mind of Number 774 was brilliantly clever and methodical, but what can an Earthman and a Martian have in common? Many points of contact exist, it is true, but for two entities so far removed from one another in physical form, senses, environment, and modes of living, with not the vaguest conception of what the other, upon the distant world, is like, such similarities of experience are extremely hard to find.

In the first place, the messages that were coming to Number 774 were the code representations of alphabetical letters standing for various sounds which, when taken in groups, made up words of vocal speech.

As previously stated, Number 774 had no idea of sound except as an in-

teresting phenomenon recorded by his scientific instruments, and as a vibration detectable by his touch sense in the same way that human beings can feel sound vibrations in solid objects. He had no ears; neither did he have well-developed vocal organs.

Strange as it may seem to us, prior to his experience with the Light, he had not the faintest idea of what a word was, either a vocal word or a written word, or a word typewritten in the form of a group of signals. Because Martian methods of communicating with one another, and of recording knowledge, are so different from ours, a word would have been as great a mystery to him as it would have been to a new-born kitten.

Describing sound to him, as we know it through our sense of hearing, would have been as hopeless a task as describing red to a man who has been stone-blind since birth. It simply could not be done. He might know that sound and vocal speech existed, but short of trading actual sensations with an Earthman, he could never fully comprehend. Neither could he have told us in any way how the color of ultra-violet or infra-red looked, for such things are totally out of our experience.

In the face of these enormous handicaps, in spite of his intelligence and scientific knowledge, he had been like a little child, humbly and intensely eager to learn, yet bungling and quick to make mistakes which, from an Earthman's point of view would often have seemed more than childish.

Once he had tried a method of his own of establishing communication. If Earth had been peopled by a race physically and psychologically similar to the Martians, quick success might have been expected; but his efforts had evoked only a, to him, meaningless jumble of flashes from the Light. Realizing that his method was not suited to Earthmen, he had given up trying to be teacher and

had assumed instead the rôle of conscientious pupil.

"Hello, Mars!" Those two groups of symbols had always been the beginning of every message flashed by the Light; but except for seeing the unmistakable evidence of intelligence in the oft-repeated and unvarying signal, Number 774 had been quite unable at first to grasp in it any thread of meaning.

A greeting phrase was, if possible, even more incomprehensible to him than a word itself. Try as he might, he could not understand. On Mars, where speech is not the mode of communication, greeting phrases did not exist.

THEN EARTHLY genius, doubtless assisted a great deal by chance, had come to his aid. Number 774 had no difficulty in separating the twenty-six alphabetical symbols of the Morse code. Nor when the Earth entities, controlling the flickerings of the Light, had sent out code symbols for numerals in a sequence of 0, 1, 2, 3, 4, 5, and so on, did he have any trouble in recognizing and cataloguing each separate signal, though their meanings were still entirely unfathomable to him.

It was when the counting proceeded above nine, and numbers of more than one digit appeared, that Number 774, after a long period of association with the riddle, had received his first faint glimmer of understanding. No; it was not really understanding yet; just a vague, intuitive intimation that something concrete and graspable was not far off.

He had noted that there were but ten separate signals in this strange system, which was apparently quite distinct from that other mysterious system of twenty-six symbols, for the two had never yet been mixed in one signal group or word, and that, as the flashing of the signals proceeded, each symbol seemed to bear a definite relationship to the others.



They always were in fixed sequence. 1 was followed by 2, 2 by 3, and so on through a sequence of ten. The first symbol of a two-digit number was always repeated ten times as the counting went on, while the second symbol changed according to the fixed rule which he had already noted.

Perhaps Number 774 already had a dim notion of the terrestrial numeral system, when his friend of the Light conceived the plan of sending simple problems of arithmetic. Obviously, one plus one of anything is two on the planet Mars just as certainly as it is on Earth.

There was the real beginning. Number 774 had studied carefully the simple equations that had come to him, and at length he had been able to grasp what was meant. In a message like "3 and 3 are 6" he was presently able to see the relationship between the numeral signals. The last in the group was the sum of the preceding two.

Finally he understood. Here was some quaint terrestrial method of expressing the unit-quantity of anything. The first point of contact between Earth and Mars had been established.

Flushed with success, Number 774 had made rapid progress for a while after he had learned about the terrestrial decimal system. "If 3 and 3 are 6, and 2 and 5 are 7, then 4 and 5 are 9. Reproducing faithfully, though without clear comprehension, the intermediate letter groups of the Earthly equation he had invented, "a-n-d" and "a-r-e", he had flashed the equation to his friend of the Light—"4 and 5 are 9."

And the answering flicker of the Light seemed to dance with an eager exultation: "4 and 5 are 9. 4 and 5 are 9. Yes, yes, yes. 5 and 5 are 10. 8 and 4 are 12. 9 and 7 are? 9 and 7 are?"

Keyed to a high pitch, Number 774 had sensed immediately what was re-

quired of him. Answers were wanted. Though two-digit numbers were still something of a mystery to him, making his reply partly guesswork, he lit upon the correct representation of the sum: "9 and 7 are 16."

Through the succeeding months, during which the positions of the two planets were favorable for astronomical observation of each other, the work had gone on, various methods being employed. Sometimes Number 774 presented his own problems of addition, giving the answers. If his answer was correct, the Light invariably flashed "Yes, yes, yes," exultantly, and repeated the equation.

On those rare occasions when the problems became more complex, Number 774 made mistakes, the answering message was "No, no, no," and the correction was made.

Thus Number 774 had gained his first knowledge of words, as represented by the twenty-six-letter-code alphabet. "Yes, yes, yes," meant that he was right, and "No, no, no," meant that he was wrong. It trickled into his mind that each group of alphabetical symbols represented, in its crude way, some definite idea. "And" and "are" in a simple addition problem, showed certain relationships between the numbers; and those relationships were different from the ones expressed by other words.

A mistake he had once made had clearly demonstrated this fact to him. It was in the transition from addition problems to problems of multiplication. 10 and 2 was different from 10 times 2, 10 and 2 made 12, while 10 times 2 made 20. "Times" represented a different relationship between numbers than "and." One indicated that the sum was to be taken, while the other indicated that the two were to be multiplied together.

In a similar way he found out what "divided by," "plus," "minus," and other words meant by noting the re-

lationship of the numbers of the equation to the final answer.

Once understanding simple division as it is done on Earth, Number 774 quickly grasped the decimal-position system of representing fractions. In an equation like  $36 \div 5$  equals 7.2, he could substitute Martian methods of representing values and division and correlate them with terrestrial methods. In the Martian way he knew what  $36 \div 5$  was, and of course his answer thus obtained might just as well be represented by the Earthly 7.2, for they were the same.

Number 774 had found in the number, 3.1416, part of which was a decimal fraction, the relationship of the circumference of a circle to its diameter, and so the oft-repeated message of the Light, "Diameter times 3.1416 equals the circumference of a circle," had a certain vague meaning for him that was not by any means complete understanding at once.

"Earth, Planet 3, Mars, Planet 4," was a message he was able to guess the meaning of correctly because in the Martian system numbers were used to designate planets in their order from the Sun. Aided by the message, "Earth Planet 3, has 1 Moon. Mars, Planet 4, has 2 moons," he had been able half to clinch his guess.

Stumblingly, yet reproducing the Earth words with the faithfulness of a good mimic, he had flashed: "Planet 1 has 0 moon. Planet 2 has 0 moon. Earth, Planet 3, has 1 moon. Mars, Planet 4, has 2—"

And an enthusiastic "Yes, yes, yes" had come from the Light, and the dim flickering glow had gone on to tell that: "Mercury, Planet 1, has no moon. Venus, Planet 2, has no moon. Jupiter, Planet 5, has 9 moons. Saturn, Planet 6, has 10 moons—". And so on out to Pluto, Planet Nine, beyond Neptune.

Thus Number 774 had learned the names of the planets and the meaning of the words "moon" and "planet." In

the same way he received a dim idea of such simple verbs as "has."

AND SO the process of his Earthly education had gone on, slowly, depending to a large extent upon brilliant though not very certain guesswork, and demanding a degree of patience in instructor and pupil for which teaching a person who has been deaf, blind, and dumb since birth, to talk, is but a feeble and inadequate analogy.

Number 774 had certain knowledge of a few Earthly words and the privilege of guessing more or less accurately on a number of others. Words like "snow," "clouds," or "storm," he could perhaps gather the general sense of fairly well. For whenever a great atmospheric disturbance appeared over the continent of the Light, disturbing observations, the Light repeated these words over and over again.

He knew a little about the structure of the simplest of verbs and perhaps somewhat more about the forming of the plurals of nouns by the addition of an "s" symbol. "Hello!" in the phrase "Hello, Mars!" still was beyond him. He could answer it correctly with "Hello, Earth!" knowing that this was the Earthly way; but the human sentiment of the greeting eluded him completely. And of course he had no sound-values to give to those Earthly words which he did understand.

Progress had been made, but the forms which the intelligences of Planet Three inhabited, their manner of living, their machines and their accomplishments, were still as much of an enigma as ever. Consummation of the great dream of intelligent communication still belonged to the future, and now there would be no future—only death and a mighty prophecy unfulfilled.

That prophecy had been, and still was, the essence of Number 774's life. In the face of defeat he still worked on the fulfillment of it now, as though a

thousand years of usefulness still lay ahead of him. It was habit, perhaps; and meanwhile his mind smoldered with thoughts which we of Earth can only guess at.

"You are late, Man of Mars. Late, late, late," the dim flicker in the vision-globe, and the brighter light in the reproducer bulb beside him, spelled; and Number 774 bent to his task.

He understood sketchily most of the message. He knew that the Light referred to him as "Man of Mars." He knew that "You are" should be followed by a group of signals describing him. Only "late," the essence of the sentence, the word which gave it sense, was new. What could "late" mean?

Intuition told him that some circumstances which existed only for the present had combined to make him "late," since he had never been called that before. What were those circumstances? He racked his brain over the question. Perhaps the Light wished to indicate that he had been delayed in sending out his flash call-signal. But this was only a guess which could be right or wrong.

Still, perhaps it could be clinched. Some other day he might be purposely several minutes behind in sending out his call; then, by way of beginning he could admit that he was "late" and, if his surmise had been correct, the Light would confirm it.

But the matter of this new combination of signals could wait now. Number 774 must watch for other, possibly intelligible, things which the Light might flash.

"Comet coming. Comet coming. Comet coming," the flicker in the reproducer bulb spelled. "Comet coming toward Sun, Mars, and Earth. Comet coming. Comet coming. Comet coming."

If Number 774 had been a man, he might have given a sudden start. And it was not the message itself that would have been responsible, even though he

caught some of its meaning. "Comet" was not a word that was new in his experience; for on several occasions when one of those long-tailed wanderers had come back into the solar system, after taking its long drive out toward interstellar space, the Light had flashed the information: "Comet coming."

Number 774 knew what "Comet" meant, and he could differentiate vaguely between "Comet coming," and "Comet going," for one indicated that the celestial visitor was entering the solar system, and the other that it was leaving. For several evenings the Light had been telling him that a comet was arriving, and he had accepted the information as nothing particularly startling or new; he had been puzzled only at the significance of the other words of the message, "toward," for instance. So far he had not been quite able to grasp "toward."

No; it was not the message itself that was so startling to Number 774. Somehow, to-night, the flashing of the distant Light on Earth, telling in its cryptic way of the arrival of the visitor, bridged a gap between two of Number 774's thoughts and furnished him with an inspiration—a colossal inspiration which only genius, backed up by a knowledge considerably in excess of that of mankind, and a wonder-deadening familiarity with marvelous scientific triumphs, would have dreamed possible of fulfillment.

In one timeless instant, all of Number 774's dreams and hopes became linked together with the comet. Might he not still be guilty of revolt against the age-honored conventions of old Mars?

### III.

SOMETHING almost electrical seemed suddenly to take possession of Number 774. His cold eyes, fixed on the reproducer bulb, glittered with impatience. The flickering message, which

a moment before would have held the complete attention of his every deductive faculty, had little interest for him now. He translated the signals perfunctorily, gathering what little meaning he could from them and not bothering to puzzle over what was new. He waited with tense eagerness for the moment when the Light would go out, and it would be his turn to speak. There was something which he *must* tell his friend of Planet Three, and he *must* tell it so that it would be understood. But how?.. How could he direct those strange, clumsy signals, of which he knew so very little, so that the information he wished to convey would be received and properly understood?

There! The closing phrase of the message from Planet Three was coming: "Earth standing by for Mars. Earth standing by—". The scarcely noticeable speck of light in the vision-globe of the telescope disappeared; the pulsating purple glow in the reproducer bulb faded out, and the darkness there seemed tense with expectancy and eager waiting. It seemed to fling an insurmountable challenge at the intellect and ingenuity of Number 774.

In their present relative positions, Earth and Mars were about fifty million miles, or four and a half light-minutes, apart. Thus any message depending on light would of course take four and a half minutes to travel from Earth to Mars, or vice versa.

To avoid confusion in exchanging their communications, Number 774 and his friend of Planet Three had worked out a system whereby each would send out his signals for two minutes, with an intervening pause of two minutes, during which the other could answer. This Earthly time interval Number 774 had learned to recognize and to interpret in terms of the Martian method of measuring time.

It was his turn now; and though he had something far more important to

say than ever before, he hesitated, all his cleverness seemingly checkmated by the immensity of his problem. But the lagging, slipping moments lashed his mind, driving it by sheer tenseness of determination to a higher pitch of keenness, almost, than ever before. At least he could try. He could guess, and he could stumble, but he could try.

The little lever of the signaling mechanism trembled in his grasp, and in response to its feeble movements the signals thundered and flared from the outer surface of the dome overhead. For a full three minutes, violating the rule, Number 774 continued to send, repeating the same phrase over and over again, changing certain words each time, in the hope of hitting the right combination that would convey his meaning.

He did not wait for a reply. Earth had already sunk low in the west, and before a reply could come the flashes arriving from the feeble station on Earth would be rendered too dim and wavering and uncertain by the almost imperceptible haze of the Martian horizon to be properly recorded. Besides, he had so little time and so much to do.

Ponderously, under his guidance, the great telescope tube swung into line with the comet, which still rode high up in the west. The circular opening in the dome shifted automatically with the telescope, keeping opposite to its muzzle.

The huge form of the comet's head filled the vision-globe, spreading brilliant and silvery and tenuous around the more solid spot of the glowing central nucleus.

Delicate instruments came into play, recording and measuring speeds, distances, and densities. But this was no mere quest for abstract scientific knowledge. His eyes smoldered with a grimly definite purpose, in which the shadow of death was very near.

But toward death Number 774's reac-

tions were hardly human. In the torrent of his thoughts one thing shone out clear—the comet would pass close to Mars, and it would also pass close to Earth. That fact offered a slender and stupendous possibility. But in ten days the comet would pass and his chance would be gone. Unless he could cram into that brief time more work than anything human or Martian had ever before been called upon to do, his opportunity would be gone forever.

He finished his measurements quickly and efficiently. Switches clicked, and great mechanisms, and incredibly delicate and sensitive instruments, ceased functioning. The circular opening in the rotunda closed, hiding the stars and the comet. The observatory was at rest, for its eerie, fragile master needed it no more.

Number 774 was hurrying down a passage, the stalky limbs of the machine that carried him making a regular, clicking sound.

He came to a great wall that tumbled away in a murky, green-lighted haze, far beneath. Without hesitation he leaped into it and, seemingly supported and retarded in his fall by the emerald substance of the glow from the metal walls, he floated downward as gently and securely as a feather in the heavy atmosphere of Earth.

At the bottom of the well another vast, low-ceiled chamber spread out, its remote walls lost in the luminescent emerald murk, through which the burnished forms of gigantic machines gleamed elfinly.

This was Number 774's workroom, and here, now, he set to work, laboring with cool, unburied efficiency, so characteristic of the children of dying Mars.

Many times before he had struggled with the same problem which now held his attention, and he had learned much concerning it, yet the technical difficulties he had encountered had con-



*He was now a giant of metal, like the five automatons that served him.*

vinced him that the solution of that problem still lay many years in the future.

But now something had happened. An unforeseen chance had come—a chance which might or might not be possible. It was all a gamble.

There was no time for further experiments. Perhaps with this new opportunity there was no need for further experiments, for Number 774 grasped the underlying principles. He must plan and build; above all he must be quick and sure.

He was thinking of a certain barren valley far out in the desert. In a thousand years, perhaps, no one had visited it except him. Aircraft hardly ever flew over that waterless sand pocket set amid the arid hills of Mars. There would be the ideal spot for the completion of his task, for here in his workshop he knew that he dared not stay.

DELICATE electrical impulses transmitted his commands, and in response five giant shapes, paradoxically human travesties wrought in shining metal, rose from their resting places to do his bidding. Under his guidance they made preparation for the exodus, gathering instruments, tools, and other paraphernalia, and packing them in metal cases; binding long arms of metal into great sheafs that would be easy to carry. Meanwhile Number 774 busied himself with a complicated Martian calculating machine.

Thus the night passed. In the almost momentary twilight that preceded the dawn, the strange caravan set out. Number 774 had changed his identity; instead of being only a fragile lump of living protoplasm, he was now a giant of metal, like the five automations that served him, for the powerful machine he rode was so versatile, and so quick and accurate in its responses to his every guiding gesture, that it was to all intents and purposes his body.

A pair of wings, of metal fabric disengaged themselves from the intricacies of his machine and began to flap ponderously. Number 774 soared upward on them, over his servitors, that plodded along on the ground, bearing their heavy burdens. His gaze darted back briefly toward the silvery dome of his workshop and at its dusty walls, matching the slightly ochre-tinged dun color of the desert.

But the fact that he had lived in that structure most of his life, and that he was now leaving it forever, aroused no sentiment in his mind. He had no time for sentiment now, for time was precious. Besides, he was looking forward to the trials and dangers that were certain to come soon and to the triumphs that might come.

He swung and turned in the air, scanning the terrain with wary watchfulness, on guard for any possible approaching aircraft. It would not be well if he was seen, and if a flier should appear he must take cover. But there was really little danger to face as far as his own people were concerned.

Avoidance of the death sentence imposed by the Rulers was practically without precedent. For thousands of years Martians had obeyed their Rulers' commands so implicitly that now prisons for the detention of the condemned were unknown. When the order came, the people of Mars went to their deaths willingly and without a guard. And so it was unlikely that any one would suspect that Number 774 had intentions of escaping execution now.

It is hardly likely that Number 774 felt triumphant over his revolt against ancient law; possibly he even felt guilty; but his earnest eagerness to learn things that he did not know, and to give himself to the cause to which his life had been pledged, was an urge that surpassed and defied even age-old code and tradition.

The stars, and leisurely Deimos, the

farther moon, shone on an ashen haze that obscured the horizon in every direction. A mounting breeze, keen and cutting for all its thinness, blew out of the west. When the sun rose, it changed the haze of the dust-laden air to a tumultuous, fiery murk that flung long, ominous streamers of orange and red across the sky. Number 774 knew what was coming and knew the hazards that it brought.

THE WIND became more and more violent, increasing by puffs and gusts, and at last settling down to a steady powerful blast of the proportions of a terrestrial hurricane. If human ears had been there to hear, they would have detected the mounting whisper and rustle of millions of flying sand particles, rubbing and sliding over each other, making a blurred and soothing pur of sound.

As the streaming, flame-bued trains of sand thickened and mounted higher in the atmosphere, the Sun dimmed to a red bubble floating in the murk, and only a bloody reminder of its normal brilliance reached the ground.

Number 774 had descended to join his robots in their march on the ground. He had seen many of these fierce dust storms of Mars, and he accepted them as a matter of course, just as an experienced old mariner of Earth accepts tempests at sea. He himself was safely incased in an air-tight glass cage atop the machine he rode; he was breathing pure filtered air.

The chief dangers were that the filtering equipment which fed oxygen to the engines of his automations would become clogged, or that he would accidentally be engulfed in some newly formed bed of quicksand, hidden beneath the clouds of dust that swirled about him. But these were unavoidable dangers which must be faced.

Under the pressure of necessity, Number 774 urged his robots to the

fastest pace they could attain in the shifting desert soil. The metal giants' long, webby limbs swung on and on steadily, into the east, breasting sand and wind, and climbing several steep rocky ridges they encountered, with agile ease, in spite of their great bulk and the weight of the burdens they carried.

Twice they crossed deep, twenty-mile-wide, artificial gorges, which on Earth have earned the not entirely correct name of "canals." Now and then, during each crossing, the dry and lifeless stalks of some weird Martian vegetation would loom dimly through the storm like grotesque totem poles. The canals were as desolate as the desert itself, for it was very early in the spring, and the water from the melting polar snow-caps had not yet come down through the network of conduits and perforated pipettes buried beneath the canal bed.

When the water did appear, vegetation would spring up in rapid growth along the bottoms of the hundreds of straight scars that had been dredged across the barren desert ages before. But as yet there was no sign of the great Martian planting machines, for it was still too early in the season even for them.

Number 774's wariness in crossing seemed completely unnecessary, for his eyes caught no sign of his own kind, or, in fact, of any living creature. He was as completely alone in the flat expanses of the canals as he was in the desert proper.

Late in the afternoon he arrived at his destination. By sunset the wind had subsided and the air was clearing. The work was already under way. Two of the robots, equipped now with great scooplike claws, had excavated a vast hole in the sand. Feverishly active, the other two were assisting Number 774 with other tasks. Rods were being arranged around the pit. Something of

a strange, dark substance was taking form. A stream of molten metal was pouring from a broad, squat mechanism. A thin trickle of white vapor trailed up in the quiet air.

At dusk Number 774 passed to look up, over the rounded hills that ringed the valley, at Planet Three that hung in the western sky, gleaming regally amid its retinue of stars. The light on that distant world would flicker in vain to-night, calling eagerly to the Man of Mars. There would be no answer. Higher up, fainter and less conspicuous, was the silvery dart of the comet.

Perhaps Number 774 was trying to imagine what his unknown friend of the Light would think when no replying flicker appeared on the disk of Mars. Perhaps he was trying to imagine, as he had done so often before, what his friend of the Light was like. Maybe he was wondering whether he should soon know.

His pause was only momentary. There was much to do, for in effect he was racing with the comet. Martians need very little sleep, and it was certain that Number 774 would get no sleep this night, nor the next, nor the next.

#### IV.

YOUNG Jack Cantrill cast a brief glance at the big Diesel engine he had been inspecting, and then, with an air of finality, wiped his grease-blackened hands on a fistful of cotton waste. The outfit was functioning perfectly. Ordinarily he might have paused for a moment to admire the easy strength and motion of the machinery to which he played nursemaid, but, lover of machines though he certainly was, he had no time now.

His eyes did not linger on the reflection of the glowing electric-light bulbs mirrored on the polished circumference of the spinning flywheel, as they usually did; nor did his attention wander to the

sparks that purred blue and steady on the brushes of the gigantic dynamo attached to the engine.

He had something far more interesting to occupy his mind, and, besides, a rather astounding idea had just occurred to him. Old Doc Waters and Yvonne might laugh at the notion; and then again they might be struck by it just as he had been. He'd have to try it out on them right away.

He tossed the handful of waste carelessly into a metal box, and then made a perfunctory reading of the meters and instruments banked close and bewildering on the switchboard. He adjusted a small rheostat and jotted something down on a chart on the wall with a red crayon. Then, heedless of his light clothing and his perspiring condition, he hurried out into the frosty desert night.

The breeze, cold and untainted by the smell of burning fuel-oil, chilled his damp body uncomfortably, but he did not heed. The steady thrud of the exhaust of the high-compression motor in the iron shack receded rapidly behind him as he ran up a path which led to the summit of a low hill.

On the crest of a neighboring knoll, a broad patch of dazzling light winked on and off regularly, where scores of huge searchlights poured their billions of candle power toward the twinkling stars, in systematically arranged long and short spurts. Jack Cantrill's glance toward them was brief but intense. His lips moved as though he were counting to himself.

The door of the domed observatory building at the top of the hill opened at his touch. He passed through a small lean-to and entered the brick-lined circular chamber that housed the telescope. Here a single shaded lamp cast a subdued glow over a big desk on which various opened notebooks and papers were scattered. Amid the litter an astronomer's chronometer ticked loudly in



the shadowed stillness. The gloom was eerie and soft and strange.

Jack Cantrill made his way quietly to the low platform under the eyepiece of the telescope, where the other two occupants of the room stood.

The girl was pretty, in a blond, elfin sort of way. She smiled briefly at Jack's approach.

"Any luck, folks?" he inquired.

He was trying to make his voice sound calm and casual, but a tense and excited huskiness crept into his words and spoiled his bluff.

Professor Waters looked up from the eyepiece of the big instrument. The glow coming from the near-by lamp accentuated the tired lines of his face, making him look almost haggard. He grinned wearily.

"Not yet, boy," he said. "It seems as though Old Faithful has deserted us completely. It's funny, too, when you remember that when conditions were at all favorable for observation, he hasn't failed me once in nine years. And yet this is the second night that he hasn't given us a sign. The shaded side of Mars hasn't shown a single flicker that you can see, and even the photo-electric cell doesn't detect anything."

The young man glanced uncertainly at the girl and then back at her father. The fingers of one of his hands crept slowly through his curly red hair. With the air of a small schoolboy about to make his first public address, he was fumbling with a soiled sheet of paper he had taken from his pocket. He felt rather sheepish about that idea he had thought of.

"Yvonne—Doc—" he said almost plaintively, in an awkward attempt to get their undivided attention centered on what he was going to say—"I'm not much of a scientist, and maybe I'm a darned fool; but—well, this message—the final one we received the night before last—we thought it was just a jumble, but, when you read it, it almost has

meaning. Here, listen to it once."

Clearing his throat he proceeded to read from the sheet of paper: "Comet coming. Yes. Comet coming. Yes. Comet coming of Man of Mars. Comet Man of Mars coming toward Earth. Comet coming Man of Mars. Man of Mars. Comet. Man of Mars. Comet. Man of Mars. Comet. Yes, yes, yes. Man of Earth. Yes, yes, yes. Signing off. Signing off."

JACK CANTRILL'S thin cheeks were flushed when he stopped reading.

"Get it?" he asked in a husky whisper.

"Get any sense out of that?"

Yvonne Waters' pretty face had paled slightly. "You mean, Jack—you mean that he wanted to say that he was coming *here*, across fifty million miles of emptiness? He can't do that! He can't! It's too far and too impossible!"

Her concerned manner bolstered up the youth's confidence in his idea. "You caught on to exactly what I thought of," he said.

Professor Waters did not betray any outward excitement. His manner was musing, and he rubbed his cheek reflectively. "I thought of that, too," he admitted after a moment. "But it seemed too wild for serious consideration. Still there's a chance—that you are right."

The thought put into words seemed suddenly to startle the old man. "God, boy!" he exploded suddenly. "Supposing it is the truth! Old Faithful signaled about the comet. If there's anything to this at all, the comet must be tied up with his coming. And for all we know the comet might help. It passes close to both Earth and Mars. If some way he could fall into its gravitation field, it would drag him almost all the way. That's it! It would save an enormous portion of the necessary propulsive energy. It would put his trip, otherwise still impossible, into the realm of possibility!"

"You get me at last, doc," Jack said

quietly. "And when you say, 'Supposing it's the truth,' think of what it means! The navigation of interplanetary space, maybe! Commerce between Earth and Mars! A new and wonderful era, with the minds of one world exchanging ideas with the minds of another."

Unconsciously Jack Cantrill had taken Yvonne Waters' hand. Her eyes were starry.

"If it did happen we'd all be heroes, Jack," she said. "Dad and you and I. We'd be the ones to get the credit."

"We would, Yvonne," Jack admitted with a chuckle.

It was the professor's turn to smile. "You two have got the whole business nicely ready-made, haven't you?" he chided. Then his face sobered as he went on: "The gap is pretty wide between Earthman and Martian; and in consequence that golden age of yours may be very far off, even if that guess of ours about the message is right."

"We don't know that Martians are human beings. The chances are a million to one that they aren't. It is very unlikely that evolution, operating on so different a planet, could produce a being even remotely resembling a man. We don't even know that the people of Mars use speech as we use it. Old Faithful certainly is very intelligent, yet the way he has fumbled blunderingly with our code seems to indicate that even a faint conception of vocal speech is something new and strange to him."

"Those are some of the gaps, but there may be sinister similarities between Earthmen and Martians."

"Who knows but that something darker lies behind what we think is friendly interest in us? Sometimes conquest is more satisfying than commerce. We can't tell." Professor Waters paused.

"Making it extra strong, aren't you, doc?" Jack put in.

"I guess I am, and now I think I'll

do a little news-spreading." The professor strode to the desk.

"Human or not, I hope the Martians are handsome," Yvonne confided impulsively to Jack.

"And I hope they're not, darling," he replied, putting his arm affectionately about her waist. He was about to add something more when what the girl's father was saying into the telephone riveted their attention.

"Long distance? I'm calling Washington. I want to speak directly to Mr. Grayson, the Secretary of War. Strange call? Perhaps. But put it through."

Before dawn all the observatories of Earth had begun their watch.

## V.

FAR AWAY on the Red Planet, the work of Number 774 went steadily forward. Then came the night when all was ready except for one thing. A powerful urge, the roots of which are deeply implanted in the dominant forms of life of both Earth and Mars, and perhaps the whole universe, was calling him to a city at the joining place of four canals, far to the east. In that urge there was a pathetic something, perfectly understandable by human standards.

The bright stars reeled dizzily before Number 774 as he swooped out over the desert on the wings of the ornithopter that bore him and sped eastward. He must be cautious, but above all he must hurry.

An hour or so slipped by. The Martian's big eyes, keen and catlike, picked out in the broad cleft of a canal a gigantic angular shape, looming dim and uncertain in the gloom. Inconspicuous as a drifting shadow, he settled toward it. The talons of his automaton found a metal panel that slipped aside at a touch. The green glow of the immense well thus revealed dropped away into

deserted obscurity. In a moment he was floating down it, past myriads of openings, from which radiated the labyrinthine tunnels of the buried Martian city.

He entered one of these passages and followed it for perhaps a mile, until he came to a vast chamber, pervaded by a moist, humid heat. The floor was covered with thousands of boxes of clear crystal; and in each box was a purple glob of something feeble and jellylike and alive.

Aided perhaps by some Martian numeral system, Number 774 found his way to the box he sought. At his touch the lid opened. He had dismounted from his automaton, and now, creeping forward, he thrust a slender appendage into the crystal case.

A score of nerve-filaments, fine, almost, as human hair, darted out from the chitinous shell that protected them and roved caressingly over the lump of protoplasm. Immediately it responded to the gentle touch of the strange creature that had sired it. Its delicate integument quivered, and a thin pseudopod coiled up from its jellylike form and enveloped the nerve filaments of Number 774. For minutes the two remained thus, perfectly motionless.

It was a bizarre travesty of a touching and perfectly human situation; yet its utter strangeness by Earthly standards robbed it of some of its pathos. No words were spoken, no sign of affection that a terrestrial being could interpret was given; and yet perhaps the exchange of feeling and thought and emotion between parent and offspring was far more complete than anything of the kind possible on Earth.

Number 774 did not forget caution. Perhaps it was intuition that informed him that some one was coming. Quickly, yet without haste, he regained his automaton, replaced the lid on the crystal box, and slipped quietly away into the luminescent obscurity of the

tunnel. In a few minutes he had safely reached the open of the canal bed. Broad wings flapped, and the starlit night swallowed him up.

As he hurried back toward his hidden valley, he saw the silvery green speck of Earth dip beneath the western horizon. The sight of it must have aroused a turmoil of forebodings within him; for absently, as if he was already facing unknown horrors in mortal combat, he moved a small switch, and in response a jagged flash of flame leaped from an apparatus carried on a long arm of his flying automaton. Where the bolt struck, the desert sand turned molten.

Above, the comet glowed, pallid and frosty and swollen. It was very near to Mars now.

Having reached his valley, Number 774 descended into the pit. A silvery thing that was illly defined in the uncertain light loomed over him. A door opened and closed, and Number 774 was alone and busy amid a bewildering array of machinery.

There came a blinding flash of incandescence, and a roar that sounded like the collision of two worlds; then a shrill, tortured, crackling whistle. The pit glowed white-hot, and the silvery thing was gone. Above the pit, towering many miles into the sky, was an immense jetted plume of vapor, shining rosy with heat. It would be many minutes before that huge gaseous cloud would cool sufficiently to be invisible.

The body of Number 774 was battered and torn and broken; the terrific acceleration was crushing him; consciousness was slipping, even though he was exerting a tremendous effort of will to cling to it. In a few minutes it would not matter if he did go out, but now there were controls to watch and to handle. If they were not manipulated properly everything he had done was for naught.

But the blackness of oblivion was

closing in. He struggled valiantly to master himself and to fight through the gathering gloom that was misting his vision and clouding his mind. Though his whole being cried out for a cessation of torturing effort, still he kept fiercely at his task. There was too much at stake. That little globe there—it was glowing red when it should glow violet. It must be attended to. The craft was wobbling, and it must not wobble. A trifling adjustment of delicate stabilizers would fix that, if he could only somehow make the adjustment.

A dribble of sticky, oozy fluid welled from a wound in Number 774's side. His limbs, some of them broken, fumbled awkwardly and inefficiently with the complicated controls. He was gasping, and all the while his glazing eyes remained fixed grimly on the form of the comet, toward which he, and the strange craft he had built, were hurtling. Could he reach it? He must!

## VI.

ON EARTH, Professor Waters, his daughter, and his young engineer, watched and waited. It was a tense, grueling task, heavy-laden with monotony, a thousand weird imaginings, and a horde of questions, none of which could be answered with any certainty.

They were uncertain whether to be fearful of the unknown thing whose approach they sensed, or to be exultant. They did not even know whether their vigil was just a huge, nerve-racking practical joke which their fancies had played upon them.

Time dragged with torturing slowness. Tardy seconds became minutes, tedious minutes were built up into hours, and hours became days that seemed like centuries. And over the rest of the world, the vigil was much the same.

On the ninth day after the last flicker-

ing message had come from Mars, Professor Waters had seen through his telescope, on the surface of the Red Planet, a fine dot of white light, that, after its sudden appearance, faded quickly to red, and then, after a few minutes, disappeared altogether. A few hours later he thought he detected a slight and momentary ripple in the gaseous substance of the comet's head, which then had just passed Mars on its Sunward journey.

Newspaper reporters who had come many miles to this lonely spot in the desert were constantly seeking interviews. The three watchers, supplied them with all the information they knew; and at last, tiring of the additional strain of being constantly hounded by these persistent seekers after sensational news, they refused even to grant them admittance into the barbed-wire stockade of the camp.

At last the comet reached its point of closest approach to the Earth. Faint and ashy though it was, low down in the sunlit afternoon heavens, still it was an awesome impressive object, with its colossal, fan-shaped head, and the vast curved sweep of its gigantic ghost-silver tail.

When the desert dusk settled, the visiting wanderer increased a score of times in brilliance and glory. It had now passed the line and was hurtling away. And as yet nothing that would satisfy the eager hopes and fears of the watchers had happened.

The three were standing on the veranda of the little adobe house they inhabited. All of a sudden Doctor Waters' haggard face relaxed. He sighed heavily.

"I guess that it has been proved that we are all of us fools," he said wearily. "There hasn't been much of anything to reward us for our pains." His glance toward Jack Cantrill was slightly apologetic. "I think I'll go to bed," he added abruptly.

Jack's rather good-looking face twisted into a rueful smile. "Bed isn't at all a bad idea," he admitted. "I feel as though I could snooze a week straight without waking up. Well, anyway, if we're fools, I'm the biggest one, because I started all this." He looked at the old man and then at the girl. "Forgive me, Yvonne?" he queried good-humoredly.

"No," she replied with mock seriousness. "Making me lose so much of my beauty sleep like this! You ought to be ashamed of yourself." Her little speech was terminated by a faintly amused chuckle, and she pinched his cheek impishly.

It was some hours after they had retired that a faint *soughing* noise began from somewhere, apparently at a great distance. It was like the sound of a suddenly stiffening night breeze, sweeping through a groove of pine trees. Something that glowed rosy with the heat of atmospheric friction swept in burbling flight across the sky. A mile or so beyond the camp, broad thin flanges of metal shot out from it, and it made a feeble attempt to steady itself and to check its almost meteoric speed. It wobbled, then fluttered down weakly. A cloud of dust and sand rose where it smashed into the ground. But there was no human eye to see. For an hour or more it gave no further sign of life or motion.

Yvonne Waters was a light sleeper. Unusual night noises ordinarily aroused her. The momentary *soughing* rustle caused her to stir, but she did not awaken. Then, toward four in the morning, another disturbance came. It was a faint stretching, creaking, straining sound, that nevertheless held a suggestion of powerful forces acting stealthily.

INSTANTLY Yvonne was wide-awake. She sat up in bed, listening. What she heard produced quick and ac-

curate associations in her nimble and cool young mind. A barbed-wire fence would make a creaking, straining noise like that, if something big and powerful was seeking tentatively to force an entrance. The stockade!

Yes; she was right. Presently there came the sharp snap and snarl that told of the sudden parting of a taut wire. Four times the sound was repeated.

Yvonne Waters had bounded out of her bunk and had rushed to a window. It was still very dark, but outlined against the stars she saw a vague shape that swayed and moved. The girl's hand groped quickly into the drawer of a small stand beside her and drew out a heavy automatic pistol. Then she hurried to the door and across the hallway.

"Dad! Jack!" she called in a husky whisper. "I've seen something big. It's coming toward the house!"

The young man responded quickly, his unshod feet thudding across the floor. His eyes narrowed when he leaned out of the window. There the thing stood, statuesquely now, not fifty paces away. It was not clearly defined in the darkness, but Jack Castrill knew at once that it was something completely out of his experience. It seemed to have an upright, cylindrical body that rose perhaps fifteen feet above the ground. Leverlike limbs projected grotesquely from the upper end of this torso, and at the lower end, there were shadowy suggestions of other limbs, long and spidery. An angular object surmounted the cylinder, and in its present position it was an outlandish travesty of the head of a man, cocked to one side, listening.

A minute passed. Obeying what must have been an automatic impulse, Yvonne Waters drew on her boots. About the camp she always dressed like the men, and during the last few nights, anticipating sudden developments, they had all slept in their clothing.

Jack Cantrill, crouching by the window, felt the short hairs at the nape of his neck stiffen. Doctor Waters' hand was on the young man's shoulder. The fingers were trembling slightly.

It was Jack who first put into words what they were all sure was the truth: "Old Faithful, I think," he whispered, without any apparent excitement.

He paused for a moment, during which neither of his companions made any comment, for even a slight sound, as far as they knew, might be heard, with disastrous consequences.

The young man was thinking fast. Something had to be done and done quickly, and it was perhaps very easy to do the wrong thing.

"Flashlight!" he whispered presently, taking command of the situation, and the girl, responding quickly to his leadership, slipped her big electric torch into his hand.

"Now out into the open—all of us," he ordered. "Armed?"

Each carried a pistol. They slipped around to the side of the house, with Cantrill in the lead. The weird giant stood as before, rigid and perfectly still.

Jack raised the flashlight. Working the flash button with his thumb, he proceeded to signal out in the Morse code, a familiar message: "Hello, Man of Mars! Hello, Man of Mars! Hello, Man of Mars!"

And the answer came immediately, flickering from a small spot of green light on the angular "head" of the automaton: "Hello, Man of Earth! Hello, Man of Earth! Comet. Comet. Comet. Comet." The message was clear enough, but there was an unusual halting, stumbling hesitancy in the way it was given. Old Faithful had always been precise and quick in the messages he had flashed from Mars.

As the three watchers stood spell-bound, the great quasi-human machine

started forward toward the house. Its movements were powerful, but drunken and unsteady. It seemed to be little more than an insensate mechanism running amuck. The intelligence that was guiding it was losing its hold. Nothing could avert an accident.

THE ROBOT struck the side of the house with a heavy thud, lurched forward, stumbled, and fell with a clatter and clang of metal, across the low roof that collapsed under its weight and the force of its overthrow. Prostrate though it was, its lower limbs continued to simulate the movements of walking.

Its arms sprawled wide, and from a metal knob at the tip of one a torrent of blue sparks began to pour into the earth, causing the patch of sand it struck to turn molten, and to boil away in a cloud of incandescent vapor. A minute must have passed before the sparks burned out, and the appendages of the machine ceased their ponderous thrashing.

Meanwhile the three watchers had been staring at the weird and inspiring sight, not knowing just what to do. But now, when quiet was restored, they edged cautiously toward the fallen machine. Jack Cantrill's flashlight beam played over the wreckage and halted upon the flattened "head" of the robot. It was pyramidal in form and had been supported by a flexible pillar of pointed metal. There was an opening in one side, and from it something had tumbled. A shadow veiled it, so that the watchers could not immediately see what it was. Then Jack leaped to a different position and poured the beam of the flashlight full upon it.

The effect of its strangeness did not come upon them right away, for they did not at once realize its true nature. It seemed at first only a sprawling mass of drab gray, as large, perhaps, as the open top of an ordinary umbrella. It might have been nothing more than a

large lump of wet mud, flattened out by being dropped.

Then, after a moment, the three took note of the ragged tendrils that radiated out from the oblate form somewhat in the manner of the arms of a starfish. The ends of some of those tendrils were slender and stalklike and were terminated by incredibly fine filaments of coral-pink. Those filaments were twitching convulsively.

Yvonne Waters was the first to find her voice. It was choking and tremulous: "The thing's alive!" she cried. "Dad! Jack! It's alive!"

Obscure primal instincts had taken possession of them. Like wary alley cats they inched their way forward, craning their necks to look closer at the creature, in which, for them, both fascination and fear were combined.

It was then they saw that the central lump of the thing was contracting in painful, jerky spasms. It was breathing, or gasping, rather. Feathery pink palps around a cone-shaped orifice that resembled the inside of a funnel coiled in agony. They could hear the monster's breath whistle through the opening in long, rasping sighs.

But the creature's eyes, fixed to the ends of two tentacular appendages that protruded from beneath the outer folds of its flattened body, regarded them with what seemed to be an interest which could not be dimmed by physical pain and suffering. They were very large eyes, three inches across, and there was in their alien, brooding intensity, slightly veiled now by the film of approaching death, a suggestion of an intelligence in this monstrous, inhuman body that was more than human.

Yvonne Waters had taken note of these things almost in the space of a moment. She saw the hideous festering gashes of wounds that must have been several days old on the body of the thing, and she saw that several of its limbs were shattered. Some of

them seemed to be partly knit, but others were evidently recent injuries. From the fresh wounds bright-red blood oozed, giving evidence of a very high haemoglobin content, which would be necessary for a creature accustomed to breathing an atmosphere much more rarefied than that of Earth.

Maybe it was because Yvonne Waters was a woman that she bridged the gap between Earthman and Martian more quickly than her companions.

"He's hurt!" she gasped suddenly. "We've got to help him some way! We ought to—ought to—get a doctor." She halted a little in expressing this last idea. It seemed so totally wild and fantastic.

"A doctor for that horror?" Jack Cantrill asked, a trifle dared.

"Yes! Well, maybe no," the girl amended. "But still we must do something. We've got to! He's human, Jack—human in everything but form. He has brains; he can feel pain like any human being. Besides, he has courage of the same kind that we all worship. Think of the pluck it took to make the first plunge across fifty million miles of cold, airless void! That's something to bow down to, isn't it? And, besides, this is our friend, Old Faithful!"

"By the gods, Yvonne, you're right!" the young man exploded with sudden realization. "And here I am, wasting time like a dumb fool!"

He dropped to his knees beside the injured Martian, and his big hands poised, ready and willing, but still uncertain how to help this bizarre entity of another world.

DOCTOR WATERS had by this time shaken the fog of sleep from his older and less agile faculties, and he was now able to grasp the situation. With a brief and crisp "I'll get the first-aid kit!" he hurried into the partially wrecked house, across the roof of which sprawled Old Faithful's automaton.

Conquering her natural revulsion, Yvonne brought herself to touch the dry, cold flesh of the Martian, and to try as best she might to ease its suffering. Presently the three of them were working over their weird patient, disinfecting and bandaging its wounds. But there was small hope that their efforts would be of any avail.

At their first touch, Old Faithful had started convulsively, as though in fear and repugnance of these, to him, horrid monsters; and a low, thick cry came from the opening in his body. But he must have realized that their intentions were harmless, for he had relaxed immediately. His breath, however, was rapidly growing weaker and more convulsive, and his eyes were glaring.

"We're dumb!" Jack stated with sudden vehemence. "He's badly hurt, but that's not all. This atmosphere is six times too dense for him. He's smothering in it—drowning! We've got to get him somewhere where the pressure won't be crushing him!"

"We'll rig up a vacuum tank down in the engine shed," said Doctor Waters. "It won't take but a minute."

It was done. However, when they were lifting "Old Faithful" onto the litter they had improvised, his body stiffened, shuddered, and grew suddenly limp. They knew that Old Faithful—Number 774—was gone. Still, to aid the remote possibility that he would revive, they placed him in the vacuum tank and exhausted most of the air so that the pressure inside duplicated that of the rarefied Martian atmosphere. Fresh air was admitted slowly through the pet cock. But within an hour Old Faithful's flesh had become stiff with *rigor mortis*. He was dead.

Much must have passed through the devious channels of his Martian mind during those brief hours on Planet Three. He must have felt satisfied that his eagerness to penetrate the unknown was partly rewarded, his ambition partly

fulfilled. He had learned what lay back of, and what had guided, the flickerings of the Light. He had seen the people of Planet Three. Perhaps, at the last, he had thought of Mars, his home, and the sorry plight of his race.

Maybe he thought of his growing offspring in that buried nursery chamber, fifty million miles away. Maybe the possibilities of Earth, as a means of aiding dying Mars, occurred to him, if it had not come into his mind before, and it is quite likely that his ideas in that direction were, not altogether altruistic toward mankind.

Certainly he hoped that his friends of the Light would find his space car and what it contained, out there in the desert, and that they would study and understand.

Dawn came, with the eastern sky sprinkled with a few pink feathery clouds that the bright Sun would soon dissipate.

In one of the various corrugated iron sheds of the camp, Yvonne, Jack, and the doctor were bending over the body of Old Faithful, which lay stiff and lifeless on a long table.

"Kind of heartless to be preparing this intelligent being for immersion in a preservative spirit bath so that a lot of curious museum-goers can have a thrill, don't you think, folks?" Jack was complaining with make-believe gruffness. "How would you like it if the situation was reversed—if we were stiff with the curious of Mars looking at us?"

"I wouldn't mind if I was dead." The girl laughed. "It would be an honor. Oh, look, Jack—the funny little mark on Old Faithful's skin—it's tattooed with red ink. What do you suppose it means?"

Jack had already seen the mark. It was a circle with a bar through the center and was, as the girl had said, an artificial decoration or symbol. Jack shrugged. "Search me, honey!" He



chuckled. "Say, doc, do you suppose that space car is around here somewhere?"

The doctor nodded. "It must be."

"Well, come on! Let's look for it, then! This can wait."

After a very hasty and sketchy breakfast, they made their way on horseback out into the desert, following the tracks the Martian robot had made.

At the summit of a rocky ridge they found what they sought—a long cylinder of metal deeply imbedded in the sand, that seemed literally to have splashed like soft mud around it. The long fins of the space car were crumpled and broken and covered with the blue-gray ash of oxidation. Here and there a fragment had peeled away, revealing bright metal beneath.

The nose of the shell had become unscrewed, exposing burnished threads that glistened in the Sun. Into the shadowed interior they made their way, rummaging gingerly among the bewildering maze of Martian instruments. The place reeked with a scorched, pungent odor.

At the rear of the cylindrical compartment they found a great round drum of metal, fitting snugly into the interior of the shell. Sleepily they wondered what was in it and made several weary attempts to move it. At nine o'clock the police guard that Doctor Waters had sent for arrived.

"Tell those damned reporters who are trying to crash in on us to go to hell," Jack Cantrill told the lieutenant in charge, as he and his two companions were starting wearily back toward camp. "We've got to snooze."

SEVERAL WEEKS had passed. In a hotel room in Phoenix, Arizona, Doctor Waters was speaking to Mr. and Mrs. Cantrill, who had just arrived.

"I'm turning the camp and the signaling apparatus over to Radeau and his associates," he was saying. "No

more signals from Mars, somehow, and I don't feel very much like continuing there, anyway. There are a lot more interesting things on the horizon.

"That drum which Old Faithful brought us—it contained models and many charts and sheets of parchment with drawings on them. I'm beginning to see light through the mystery at last. There are suggestions there for constructing a space ship. I'm going to work on that problem as long as I live.

"Maybe I'll succeed with the help of Old Faithful. Human ingenuity will have to be called on, too, of course. I don't think that the Martians have the problem completely solved themselves. Old Faithful used the comet, you know."

The doctor's smile broadened as he went on: "Children, how would you like to go to Mars with me some day?"

"Don't ask silly questions, dad," said Yvonne. "We'd go in a minute!"

The young man nodded seriously. "What a honeymoon that would make, if we could have it now!" he enthused.

"A million times better than going to Seattle," the girl agreed.

The doctor grinned faintly. "Even if you were treated like poor Old Faithful—pickled and put in a museum?"

"Even if!"

Jack Cantrill's eyes narrowed and seemed to stare far away into nothing. His lips and his gaunt sunburned cheeks were stern. Perhaps he was looking into the future toward adventures that might or might not come.

Something of the same rugged spirit seemed suddenly to have infused itself into the strong, bronzed beauty of the girl at his side. They both loved adventure; they both knew life in the rough.

At the door Yvonne kissed her father good-by. "Just a little run up to Seattle, dad," she explained cheerily, "two or three weeks, maybe. Then both of us back with you—to work."



*Their bodies were globular, and each one walked upon three short legs.*

# The Skylark of Valeron

*Part Five—the story of Valeron, and the hideous enemy that assaulted its civilization*

by Edward E. Smith, Ph.D.

Illustrated by Elliot Dold

## UP TO NOW:

Richard Seaton liberates the intra-atomic energy of copper. He and Martin Crane build a space ship, "Skylark of Space." Brookings, wily head of the World Steel Corporation, tries to steal the invention. Failing, he calls in DuQuesne, an unscrupulous scientist, who succeeds. DuQuesne builds a space ship from the stolen plans and abducts Dorothy Vaneman, Seaton's fiancée, and Margaret Spencer. Out of control, his ship drives through space until her copper is exhausted.

Seaton and Crane follow DuQuesne by means of an "object-compass" focused upon him. They effect a rescue, but their fuel runs low. Several planets are visited, one of which has been materialized by a group of purely intellectual beings. Escaping from these entities, they fly toward a cluster of green runs.

They land upon Osnome and are of service to Kondal, a nation of that world, against Mardonale, its other nation. Seaton marries Dorothy, Crane marries Margaret. They return to Earth, DuQuesne escaping just before landing.

Summoned by Dunark of Osnome, Seaton and his friends return there in "Skylark Two." On the way they meet and defeat a war vessel of the Fenachrome, a monstrous race of vast scientific ability whose goal is universal con-

quest. In search of a science to equal that of the Fenachrome Seaton visits Urcama, a planet then at war with Osnome; Dasor, a watery world inhabited by a race of almost amphibious humanity; and lastly Norlamin, where he finds the science he is seeking.

Rovol, First of Rays, and Dramnik, First of Psychology, each impress upon Seaton's brain a large measure of his own knowledge. They build a fifth-order projector and destroy all the Fenachrome vessels in space save one, which has left this Galaxy entirely. "Skylark Three" is built, and Seaton sets out after the fleeing vessel, emerging victorious from a titanic battle.

DuQuesne and Loring, his assistant, visit Norlamin, where they pretend to be Seaton's employees and persuade Rovol to build them a duplicate of "Skylark Three." They set out, supposedly to Seaton's aid; but double back to Earth, where DuQuesne makes himself the undisputed master of the planet.

Seaton succeeds in generating waves of the sixth order and learns that thought lies in that level. "Skylark Three" is attacked by the purely intellectual entities. To escape from them, Seaton rotates "Skylark Two," which has been carried as a lifeboat, into the fourth dimension, finding it a peculiar region indeed.

Back in ordinary space, Crane discovers that they are so far away from the

*First Galaxy that an object-compass focused upon its entire mass fails to register. To find their way back they must build a sixth-order projector. They fly to the nearest Galaxy and seek out, by way of projection, a solar system as nearly as possible like our own.*

*In that system they find an interloping planet having an atmosphere of chlorine. They find an Earthlike planet and learn that its people, just recovering from the devastation of their world caused by the near-collision of suns, are being wiped out by the inhabitants of that foreign, chlorinaceous planet which their sun had taken from the passing sun.*

## XVI.

AS SEATON assumed, the near-collision of suns which had affected so disastrously the planet Valeron did not come unheralded to overwhelm a world unwarned, since for many hundreds of years her civilization had been of a high order indeed.

With all their resources of knowledge and of power, however, it was pitifully little that the people of Valeron could do; for of what avail are the puny energies of man compared to the practically infinite forces of cosmic phenomena? Any attempt of the humanity of the doomed planet to swerve from their courses the incomprehensible masses of those two hurtling suns was as surely doomed to failure as would be the attempt of an ant to thrust from its rails an onrushing locomotive.

But what little could be done was done; done scientifically and logically; done, if not altogether without fear, at least inasmuch as was humanly possible without favor. With mathematical certainty were plotted the areas of least strain, and in those areas were constructed shelters. Shelters buried deeply enough to be unaffected by the coming upheavals of the world's crust; shelters of unbreakable metal, so designed, so

latticeed and braced as to withstand the seismic disturbances to which they were inevitably to be subjected.

Having determined the number of such shelters that could be built, equipped, and supplied with the necessities of life in the time allowed, the board of selection began its cold-blooded and heartless task. Scarcely one in a thousand of Valeron's teeming millions was to be given a chance for continued life, and they were to be chosen only from the children who would be in the prime of young adulthood at the time of the catastrophe.

These children were the pick of the planet: flawless in mind, body, and heredity. They were assembled in special schools near their assigned refuges, where they were instructed intensively in everything that they would have to know in order that civilization should not disappear utterly from the universe.

Such a thing could not be kept a secret long, and it is best to touch as lightly as possible upon the scenes which ensued after the certainty of doom became public knowledge.

Characters already strong were strengthened, but those already weak went to pieces entirely in orgies to a normal mind unthinkable. Almost overnight a peaceful and law-abiding world went mad—became an insane hotbed of crime, rapine, and pillage unspeakable. Martial law was declared at once, and after a few thousand maniacs had been ruthlessly shot down, the soberer inhabitants were allowed to choose between two alternatives. They could either die then and there before a firing squad, or they could wait and take whatever slight chance there might be of living through what was to come—but devoting their every effort meanwhile to the end that through those selected few the civilization of Valeron should endure.

Many chose death and were executed

summarily and without formality, without regard to wealth or station. The rest worked.

SINCE the human mind cannot be kept indefinitely at high tension, the new condition of things came in time to be regarded almost as normal, and as months lengthened into years the routine was scarcely broken.

But always there were the sly,—the self-seekers, the bribers, the corruptionists—willing to go to any lengths whatever to avoid their doom. Not openly did they carry on their machinations, but like loathsome worms eating at the heart of an outwardly fair fruit. But the scientists, almost to a man, were loyal. Trained to think, they thought clearly and logically, and surrounded themselves with soldiers and guards of the same stripe.

Time went on. The shelters were finished. Into them were taken stores, libraries, tools and equipment of every sort necessary for the rebuilding of a fully civilized world. Finally the "children," now in the full prime of young manhood and young womanhood, were carefully checked in. Once inside those massive portals of metal they were of a world apart.

They were completely informed and completely educated; they had for long governed themselves with neither aid nor interference; they knew precisely what they must face; they knew exactly what to do and exactly how to do it. Behind them the mighty, multi-ply seals were welded into place and broken rock by the cubic mile was blasted down upon their refuges.

Day by day the heat grew more and more intense. The tides waxed ever higher. Cyclonic storms raged ever fiercer, accompanied by an incessant blaze of lightning and a deafeningly continuous roar of thunder.

Work was at an end and the masses were utterly beyond control. The de-

voted were butchered by their frantic fellows; the hopeless were stung to madness; the stolid were driven to frenzy by the realization that there was to be no future; the remaining sly ones deftly turned the unorganized fury of the mob into a purposeful attack upon the shelters, their only hope of life.

But at each refuge the rabble met an unyielding wall of guards loyal to the last, and of scientists who, their work now done, were merely waiting for the end. Guards and scientists fought with rays, rifles, swords, and finally with clubs, stones, fists, feet and teeth. Out-numbered by thousands they fell and the howling mob surged over their bodies. To no purpose. Those shelters had been designed and constructed to withstand the attacks of nature gone berserk, and futile indeed were the attempts of the frenzied hordes to tear a way into their sacred recesses.

Thus died the devoted and high-souled band who had saved their civilization; but in that death each man was granted the boon which, deep in his heart, he had craved. They had died quickly and violently, fighting for a cause they knew to be good.

THE SUNS passed, each upon his appointed way. The cosmic forces ceased to war and to the tortured and ravaged planet there at last came peace. The surviving children of Valeron emerged from their subterranean retreats and undauntedly took up the task of rebuilding their world. And to such good purpose did they devote themselves to the problems of rehabilitation that in a few hundred years there bloomed upon Valeron a civilization and a culture scarcely to be equaled in the universe.

For the new race had been cradled in adversity. In its ancestry there was no physical or mental taint or weakness, all dross having been burned away by the fires of cosmic catastrophe which

had so nearly obliterated all the life of the planet.

Immediately after the Emergence it had been observed that the two outermost planets of the system had disappeared and that in their stead revolved a new planet. This phenomenon was recognized for what it was, an exchange of planets; something to give concern only to astronomers, and to them only mathematically, in the computation of now greatly perturbed orbits.

No one except sheerest romancers even gave thought to the possibility of life upon other worlds, it being an almost mathematically demonstrable fact that the Valeronians were the only life in the entire universe. And even if other planets might possibly be inhabited, what of it? The vast reaches of empty ether intervening between Valeron and even her nearest fellow planet formed an insuperable obstacle even to communication, to say nothing of physical passage.

When the interplanetary invaders were discovered upon Valeron, Quedrin Vornel, the most brilliant physicist of the planet, and his son Quedrin Radnor, the most renowned, were among the first to be informed of the visitation.

Of these two, Quedrin Vornel had for many years been engaged in researches of the most abstruse and fundamental character upon the ultimate structure of matter. He had delved deeply into those which we know as matter, energy, and ether, and had studied exhaustively the phenomena characteristic of or associated with atomic, electronic, and photonic rearrangements.

His son, while a scientist of no mean attainments in his own right, did not possess the phenomenally powerful and profoundly analytical mind that had made the elder Quedrin the outstanding scientific genius of his time. He was, however, a synchronizer *par excellence*, possessing to a unique degree the ability

to develop things and processes of great utilitarian value from concepts and discoveries of a purely scientific and academic nature.

The vibrations which we know as Hertzian waves had long been known and had long been employed in radio, both broadcast and tight-beam, in television, in beam-transmission of power, and in receiverless visirays and their blocking screens. When Quedrin the elder disrupted the atom, however, successfully and safely liberating and studying not only its stupendous energy but also an entire series of vibrations, rays, and particles theretofore unknown to science, Quedrin the younger began forthwith to turn the resulting products to the good of mankind.

Intra-atomic energy soon drove every prime mover of Valeron and shorter and shorter waves were harnessed. In beams, fans, and broadcasts Quedrin Radnor combined and heterodyned them, making of them tools and instruments immeasurably superior in power, precision, and adaptability to anything that his world had ever before known.

Due to the signal abilities of brilliant father and famous son, the laboratory in which they labored was connected by a private communication beam with the executive office of the Bardyle of Valeron. "Bardyle," freely translated, means "coördinator." He was neither king, emperor, nor president; and, while his authority was supreme, he was in no sense a dictator.

A paradoxical statement this, but a true one; for the orders—or rather, requests and suggestions—of the Bardyle merely guided the activities of men and women who had neither government nor laws, as we understand the terms, but were working of their own volition for the good of all mankind. The Bardyle could not conceivably issue an order contrary to the common weal, nor would such an order have been obeyed.

UPON the wall of the laboratory the tuned buzzer of Bardyle's beam-communicator sounded its subdued call and Klynor Siblin, the scientist's capable assistant, took the call upon his desk instrument. A strong, youthful face appeared upon the screen.

"Radnor is not here, Siblin?" The pictured visitor glanced about the room as he spoke.

"No, sir. He is out in the space ship, making another test flight. He is merely circling the world, however, so that I can easily get him on the plate here if you wish."

"That would perhaps be desirable. Something very peculiar has occurred, concerning which all three of you should be informed."

The connections were soon made and the Bardyle went on:

"A semicircular dome of force has been erected over the ruins of the ancient city of Mocelyn. It is impossible to say how long it has been in place, since you know the ruins lie in an entirely unpopulated area. It is, however, of an unknown composition and pattern, being opaque to vision and to our visibeam. It is also apparently impervious to matter. Since this phenomenon seems to lie in your province I would suggest that you three men investigate it and take such steps as you deem necessary."

"It is noted, O Bardyle," and Klynor Siblin cut the beam.

He then shot out their heaviest visiray beam, poising its viewpoint directly over what, in the days before the cataclysm, had been the populous city of Mocelyn.

Straight down the beam drove, upon the huge hemisphere of greenly glinting force; urged downward by the full power of the Quedrins' mighty generators. By the very vehemence of its thrust it tore through the barrier, but

only for an instant. The watchers had time to perceive only fleetingly a greenish-yellow haze of light, but before any details could be grasped their beam was snapped—the automatically reacting screens had called for and had received enough additional power to neutralize the invading beam.

Then, to the amazement of the three physicists, a beam of visible energy thrust itself from the green barrier and began to feel its way along their own invisible visiray. Siblin cut off his power instantly and leaped toward the door.

"Whoever they are, they know something!" he shouted as he ran. "Don't want them to find this laboratory, so I'll set up a diversion with a rocket plane. If you watch at all, Vornel, do it from a distance and with a spy ray, not a carrier beam. I'll get in touch with Radnor on the way."

Even though he swung around in a wide circle, to approach the strange stronghold at a wide angle to his former line, such was the power of the plane that Siblin reached his destination in little more than an hour. Keying Radnor's visibeam to the visiplates of the plane, so that the distant scientist could see everything that happened, Siblin again drove a heavy beam into the unyielding pattern of green force.

This time, however, the reaction was instantaneous. A fierce tongue of green flame licked out and seized the flying plane in mid-air. One wing and side panel were sliced off neatly and Siblin was thrown out violently, but he did not fall. Surrounded by a vibrant shell of energy, he was drawn rapidly toward the huge dome. The dome merged with the shell as it touched it, but the two did not coalesce. The shell passed smoothly through the dome, which as smoothly closed behind it. Siblin inside the shell, the shell inside the dome.

## XVII.

SIBLIN never knew exactly what happened during those first few minutes, nor exactly how it happened. One minute, in his sturdy plane, he was setting up his "diversion" by directing a powerful beam of force upon the green dome of the invaders. Suddenly his rocket ship had been blasted apart and he had been hurled away from the madly spinning, gyrating wreckage.

He had a confused recollection of sitting down violently upon something very hard, and perceived dully that he was lying asprawl upon the inside of a greenish shimmering globe some twenty feet in diameter. Its substance had the hardness of chilled steel, yet it was almost perfectly transparent, seemingly composed of cold green flame, pale almost to invisibility. He also observed, in an incurious, foggy fashion, that the great dome was rushing toward him at an appalling pace.

He soon recovered from his shock, however, and perceived that the peculiar ball in which he was imprisoned was a shell of force, of formula and pattern entirely different from anything known to the scientists of Valeron. Keenly alive and interested now, he noted with high appreciation exactly how the wall of force that was the dome merged with, made way for, and closed smoothly behind the relatively tiny globe.

Inside the dome he stared around him, amazed and not a little awed. Upon the ground, the center of that immense hemisphere, lay a featureless, football-shaped structure which must be the vessel of the invaders. Surrounding it there were massed machines and engineering structures of unmistakable form and purpose; drills, derricks, shaft heads, skips, hoists, and other equipment for boring and mining. From the lining of the huge dome there radiated a strong, lurid, yellowish-green light which intensified to positive

ghastliness the natural color of the gaseous chlorin which replaced the familiar air in that walled-off volume so calmly appropriated to their own use by the Outlanders.

As his shell was drawn downward toward the strange scene Siblin saw many moving things beneath him, but was able neither to understand what he saw nor to correlate it with anything in his own knowledge or experience. For those beings were amorphous. Some flowed along the ground, formless blobs of matter; some rolled, like wheels or like barrels; many crawled rapidly, snake-like; others resembled animated pancakes, undulating flatly and nimbly about upon a dozen or so short, tentacular legs; only a few, vaguely man-like, walked upright.

A glass cage, some eight feet square and seven high, stood under the towering bulge of the great ship's side; and as his shell of force engulfed it and its door swung invitingly open, Siblin knew that he was expected to enter it.

Indeed, he had no choice—the fabric of cold flame that had been his conveyance and protection vanished, and he had scarcely time to leap inside the cage and slam the door before the noxious vapors of the atmosphere invaded the space from which the shell's impermeable wall had barred it. To die more slowly, but just as surely, from suffocation? No, the cage was equipped with a thoroughly efficient oxygen generator and air purifier; there were stores of Valeronian food and water; there were a chair, a table, and a narrow bunk; and, wonder of wonders, there were even kits of toilet articles and of changes of clothing.

Far above a great door opened. The cage was lifted and, without any apparent means either of support or of propulsion, it moved through the doorways and along various corridors and halls, coming finally to rest upon the floor in one of the innermost compartments of



the sky rover. Siblin saw masses of machinery, panels of controlling instruments, and weirdly multiform creatures at station; but he had scant time even to glance at them, his attention being attracted instantly to the middle of the room where, lying in a heavily reinforced shallow cup of metal upon an immensely strong, low table, he saw a—*something*; and for the first time an inhabitant of Valeron saw at close-range one of the invaders.

It was in no sense a solid, nor a liquid, nor yet a jelly; although it seemed to partake of certain properties of all three. In part it was murkily transparent, in part greenish translucent, in part turbidly opaque; but in all it was intrinsically horrible.

But that it was sentient and intelligent there could be no doubt. Not only could its malign mental radiations be felt, but its brain could be plainly seen; a huge, intricately convolute organ suspended in an unyielding but plastic medium of solid jelly. Its skin seemed thin and frail, but Siblin was later to learn that that tegument was not only stronger than rawhide, but was more pliable, more elastic, and more extensible than the finest rubber.

AS THE Valeronian stared in helpless horror that peculiar skin stretched locally almost to vanishing thinness and an enormous, Cyclopean eye developed. More than an eye, it was a special organ for a special sense which humanity has never possessed, a sense combining ordinary vision with something infinitely deeper, more penetrant and more powerful. Vision, hypnotism, telepathy, thought-transference—something of all three, yet in essence a thing beyond any sense or faculty known to us or describable in language had its being in the almost-visible, almost-tangible beam of force which emanated from the single, temporary "eye" of the Thing and bored through the eyes and deep into the brain

of the Valeronian. Siblin's very senses reeled under the impact of that wave of mental power, but he did not quite lose consciousness.

"So you are one of the ruling intelligences of this planet—one of its most advanced scientists?" The scornful thought formed itself, coldly clear, in his mind. "We have always known, of course, that we are the highest form of life in the universe, and the fact that you are so low in the scale of mentality only confirms that knowledge. It would be surprising indeed if such a noxious atmosphere as yours could nurture any real intelligence. It will be highly gratifying to report to the Council of Great Ones that not only is this planet rich in the materials we seek, but that its inhabitants, while intelligent enough to do our bidding in securing those materials, are not sufficiently advanced to cause us any trouble."

"Why did you not come in peace?" Siblin thought back. Neither cowed nor shaken, he was merely amazed at the truculently overbearing mien of the strange entity.

"Bah!" snapped the amorphous savagely. "That is the talk of a weakling—the whining, begging reasoning of a race of low intelligence, one which knows and acknowledges itself inferior. Know you, feeble brain, that we of Chlora—to substitute an intelligible word for the unpronounceable and untranslatable thought-image of his native world—"neither require nor desire co-operation. We are in no need either of assistance or of instruction from any lesser and lower form of life. We instruct. Other races, such as yours, either obey or are obliterated. I brought you aboard this vessel because I am about to return to my own planet, and had decided to take one of you with me, so that the other Great Ones of the Council may see for themselves what form of life this Valeron boasts.

"If your race obeys our commands

implicitly and does not attempt to interfere with us in any way, we shall probably permit most of you to continue your futile lives in our service; such as in mining for us certain ores which, relatively abundant upon your planet, are very scarce upon ours.

"As for you personally, perhaps we shall destroy you after the other Great Ones have examined you, perhaps we shall decide to use you as a messenger to transmit our orders to your fellow creatures. Before we depart, however, I shall make a demonstration which should impress upon even such feeble minds as those of your race the futility of any thought of, opposition to us. Watch carefully—everything that goes on outside is shown in the view box."

Although Siblin had neither heard, felt, nor seen the captain issue any orders, all was in readiness for the take-off. The mining engineers were all on board, the vessel was sealed for flight, and the navigators and control officers were at their panels. Siblin stared intently into the "view box," the three-dimensional visiplat that mirrored faithfully every occurrence in the neighborhood of the Chloran vessel.

The lower edge of the hemisphere of force began to contract, passing smoothly through or around—the spectator could not decide which—the ruins of Moedyn, hugging or actually penetrating the ground, allowing not even a whiff of its precious chlorin content to escape into the atmosphere of Valeron. The ship then darted into the air and the shrinking edge became an ever-decreasing circle upon the ground beneath her. That circle disappeared as the meeting edge fused and the wall of force, now a hollow sphere, contained within itself the atmosphere of the invaders.

High over the surface of the planet sped the Chloran raider toward the nearest Valeronian city, which happened to be only a small village. Above the

unfortunate settlement the callous monstrosity poised its craft, to drop its dread curtain of strangling, choking death.

Down the screen dropped, rolling out to become again a hemispherical wall, sweeping before it every milliliter of the life-giving air of Valeron and drawing behind it the noxious atmosphere of Chlora. For those who have ever inhaled even a small quantity of chlorin it is unnecessary to describe in detail the manner in which those villagers of Valeron died; for those who have not, no possible description could be adequate. Suffice it to say, therefore, that they died—horribly.

AGAIN the wall of force rolled up, coming clear up to the outer skin of the cruiser this time, in its approach liquefying the chlorin and forcing it into storage chambers. The wall then disappeared entirely, leaving the marauding vessel starkly outlined against the sky. Then, further and even more strongly to impress the raging but impotent Klynor Siblin:

"Beam it down!" the amorous captain commanded, and various officers sent out thin, whiplike tentacles toward their controls.

Projectors swung downward and dense green pillars of flaming energy erupted from the white-hot refractories of their throats. And what those green pillars struck subsided instantly into a pool of hissing, molten glass. Methodically they swept the entire area of the village.

"You monster!" shrieked Siblin, white, shaken, almost beside himself. "You vile, unspeakable monster! Of what use is such a slaughter of innocent men? They have not harmed you—"

"Indeed they have not, nor could they," the amorous interrupted callously. "They mean nothing whatever to me, in any way. I have gone to the trouble

of wiping out this city to give you and the rest of your race an object lesson; to impress upon you how thoroughly unimportant you are to us and to bring home to you your abject helplessness. Your whole race is, as you have just shown yourself to be, childish, soft, and sentimental, and therefore incapable of real advancement. On the contrary we, the masters of the universe, do not suffer from silly inhibitions or from foolish weaknesses."

The eye faded out, its sharp outlines blurring gradually as its highly specialized parts became transformed into or were replaced by the formless gel composing the body of the creature. The amorphous then poured himself out of the cup, assumed the shape of a doughnut, and rolled rapidly out of the room.

When the Chloran captain had gone, Siblin threw himself upon his narrow bunk, fighting savagely to retain his self-control. He must escape—he must escape—the thought repeated itself endlessly in his mind—but how? The glass walls of his prison were his only defense against hideous death. Nowhere in any Chloran thing, nowhere in any nook or cranny of the noisome planet toward which he was speeding, could he exist for a minute except inside the cell which his captors were keeping supplied with oxygen. No tools—nothing from which to make a protective covering—no way of carrying air—nowhere to go—helpless, helpless—even to break that glass meant death—

AT LAST he slept, fitfully, and when he awoke the vessel was deep in interplanetary space. His captors paid no further attention to him—he had air, food, and water, and if he chose to kill himself that was of no concern to them—and Siblin, able to think more calmly now, studied every phase of his predicament.

There was absolutely no possibility

of escape. Rescue was out of the question. He could, however, communicate with Valeron, since in his belt were tiny sender and receiver, attached by tight beams to instruments in the laboratory of the Quedrina. Detection of that pencil beam might well mean instant death, but that was a risk which, for the good of humanity, must be run. Lying upon his side, he concealed one ear plug under his head and manipulated the tiny sender in his belt.

"Quedrin Radnor—Quedrin Vornel"—he called for minutes, with no response. Truly, something of grave import must have happened to cause complete desertion of that laboratory. However, it mattered little; his messages would be recorded. He went on to describe in detail, tersely, accurately, and scientifically, everything that he had observed and deduced concerning the Chlorans, their forces, and their mechanisms.

"We are now approaching the planet," he continued, now an observer reporting what he saw in the view box. "It is apparently largely land. It has north and south polar ice caps. A dark area, which I take to be an ocean, is the most prominent feature visible at this time. It is diamond-shaped and its longer axis, lying north and south, is about one quarter of a circumference in length. Its shorter axis, about half that length, lies almost upon the equator. We are passing high above this ocean, going east.

"East of the ocean and distant from it about one fifth of a circumference lies quite a large lake, roughly elliptical in shape, whose major axis lies approximately northeast and southwest. We are dropping toward a large city upon the southeast shore of this lake, almost equally distant from its two ends. Since I am to be examined by a so-called 'Council of Great Ones,' it may be that this city is their capital.

"No matter what happens, do not at-

tempt to rescue me, as it is entirely hopeless. Escape is likewise impossible, because of the lethal atmosphere. There is a strong possibility, furthermore, that I may be returned to Valeron as a messenger to our race. This possibility is my only hope of returning. I am sending this data and will continue to send it as long as is possible, simply to aid you in deciding what shall be done to defend our civilization against these monsters.

"We are now docking, near a large, hemispherical dome of force— My cell is being transported through the atmosphere toward that dome— It is opening. I do not know whether my beam can pass out through it, but I shall keep on sending— Inside the dome there is a great building, toward which I am floating— I am inside the building, inside a glass compartment which seems to be filled with air— Yes, it is air, for the creatures who are entering it are wearing protective suits of some transparent substance. Their bodies are now globular and they are walking, each upon three short legs. One of them is developing an eye, similar to the one I describe—"

Siblin's message stopped in the middle of a word. The eye had developed and in its weirdly hypnotic grip the Valeronian was helpless to do anything of his own volition. Obeying the telepathic command of the Great One, he stepped out into the larger room and divested himself of his scanty clothing. One of the monstrosities studied his belt briefly, recognized his communicator instruments for what they were, and kicked them scornfully into a corner— thus rendering it impossible for either captive or captors to know it when that small receiver throbbled out its urgent message from Quedrin Radnor.

The inspection and examination finished, it did not take long for the monstrosities to decide upon a course of action.

"Take this scum back to its own planet as soon as your cargo is unloaded," the chief Great One directed. "You must pass near that planet on your way to explore the next one, and it will save time and inconvenience to let it carry our message to its fellows."

Out in space, speeding toward distant Valeron, the captain again communicated with Siblin:

"I shall land you close to one of your inhabited cities and you will at once get in touch with your Bardyle. You already know what your race is to do, and you have in your cage a sample of the ore with which you are to supply us. You shall be given twenty of your days in which to take from the mine already established by us enough of that ore to load this ship—ten thousand tons. The full amount—and pure mineral, mind you, no base rock—must be in the loading hoppers at the appointed time or I shall proceed to destroy every populated city, village, and hamlet upon the face of your globe."

"But that particular ore is rare!" protested Siblin. "I do not believe that it will prove physically possible to recover such a vast amount of it in the short time you are allowing us."

"You understand the orders—obey them or die!"

## XVIII.

VERY NEAR to Valeron, as space distances go, yet so far away in terms of miles that he could take no active part whatever in the proceedings, Quedrin Radnor sat tense at his controls, staring into his powerful visiplates. Even before Klynor Siblin had lifted his rocket plane off the ground, Radnor had opened his throttles wide. Then, his ship hurtling at full drive toward home, everything done he could do, he sat and watched.

Watched, a helpless spectator. Watched while Siblin made his futilely

spectacular attack; watched the gallant plane's destruction; watched the capture of the brave but foolhardy pilot; watched the rolling up and compression of the Chloran dome; watched in agony the obliteration of everything, animate and inanimate, pertaining to the outlying village; watched in horrified relief the departure of the invading space ship.

Screaming through the air, her outer plating white hot from its friction, her forward rocket tubes bellowing a vicious crescendo, Radnor braked his ship savagely to a landing in the dock beside the machine shop in which she had been built. During that long return voyage his mind had not been idle. Not only had he decided what to do, he had also made rough sketches and working drawings of the changes which must be made in his peaceful space ship to make of her a superdreadnought of the void.

This was not as difficult an undertaking as might be supposed. She already had power enough and to spare, her generators and connectors being able to supply, hundreds of times over, her maximum present drain; and, because of the ever-present danger of collision with meteorites, she was already amply equipped with repeller screens and with automatically tripped zones of force. Therefore all that was necessary was the installation of the required offensive armament—beam projectors, torpedo tubes, fields of force, controls, and the like—the designing of which was a simple matter for the brain which had tamed to man's everyday use the ultimately violent explosiveness of intra-atomic energy.

Radnor first made sure that the machine-shop superintendent, master mechanic, and foremen understood the sketches fully and knew precisely what was to be done. Then, confident that the new projectors would project and that the as yet nonexistent oxygen bombs would explode with their

theoretical violence, he hurried to the office of the Bardyle. Already gathered there was a ~~potent~~ group. Besides the coordinator there were scientists, engineers, architects, and beam specialists, as well as artists, teachers, and philosophers.

"Greetings, Quedrin Radnor!" began the Bardyle. "Your plan for the defense of Valeron has been adopted, with a few minor alterations and additions suggested by other technical experts. It has been decided, however, that your proposed punitive visit to Chloran cannot be approved. As matters now stand it can be only an expedition of retaliation and vengeance, and as such can in no wise advance our cause."

"Very well, O Bardyle! It is——" Radnor, trained from infancy in co-operation, was accepting the group decision as a matter of course when he was interrupted by an emergency call from his own laboratory. An assistant, returning to the temporarily deserted building, had found the message of Klynor Siblin and had known that it should be given immediate attention.

"Please relay it to us here, at once," Radnor instructed; and, when the message had been delivered:

"Fellow councilors, I believe that this word from Klynor Siblin will operate to change your decision against my proposed flight to Chloran. With these incomplete facts and data to guide me I shall be able to study intelligently the systems of offense and of defense employed by the enemy, and shall then be in position to strengthen immeasurably our own armament. Furthermore, Siblin was alive within the hour—there may yet be some slight chance of saving his life in spite of what he has said."

The Bardyle glanced once around the circle of tense faces, reading in them the consensus of opinion without having recourse to speech.

"Your point is well taken, Councilor Quedrin, and for the sake of acquiring

knowledge your flight is approved," he said slowly. "Provided, however—and this is a most important proviso—that you can convince us that there is a reasonable certainty of your safe return. Klynor Siblin had, of course, no idea that he would be captured. Nevertheless, the Chlorans took him, and his life is probably forfeit. You must also agree not to jeopardize your life in any attempt to rescue your friend unless you have every reason to believe that such an attempt will prove successful. We are insisting upon these assurances because your scientific ability will be of inestimable value to Valeron in this forthcoming struggle, and therefore your life must at all hazards be preserved."

"To the best of my belief and ability my safe return is certain," replied Radnor positively. "Siblin's plane, used only for low-speed atmospheric flying, had no defenses whatever and so fell an easy prey to the Chlorans' attack. My ship, however, was built to navigate space, in which it may meet at any time meteorites traveling at immensely high velocities, and is protected accordingly. She already had four courses of high-powered repeller screens, the inside course of which, upon being punctured, automatically throws around her a zone of force.

"This zone, as most of you know, sets up a stasis in the ether itself, and thus is not only absolutely impervious to and unaffected by any material substance, however applied, but is also opaque to any vibration or wave-form propagated through the ether. In addition to these defenses I am now installing screens capable of neutralizing any offensive force with which I am familiar, as well as certain other armament, the plans of all of which are already in your possession, to be employed in the general defense.

"I agree also to your second condition."

"Such being the case your expedition is approved," the Bardyle said, and Radnor made his way back to the machine shop.

HIS FIRST care was to tap Siblin's beam, but his call elicited no response. Those ultrainstruments were then lying neglected in a corner of an air-filled room upon far Chlora, where the almost soundless voice of the tiny receiver went unheard. Setting upon his receiver a relay alarm to inform him of any communication from Siblin, Radnor joined the force of men who were smoothly and efficiently re-equipping his vessel.

In a short time the alterations were done, and, armed now to the teeth with vibratory and with solid and gaseous destruction, he lifted his warship into the air, grimly determined to take the war into the territory of the enemy.

He approached the inimical planet cautiously, knowing that their cities would not be undefended, as were those of his own world, and fearing that they might have alarms and detector screens of which he could know nothing. Poised high above the outermost layer of that noxious atmosphere he studied for a long time every visible feature of the world before him.

In this survey he employed an ordinary, old-fashioned telescope instead of his infinitely more powerful and maneuverable visirays, because the use of the purely optical instrument obviated the necessity of sending out forces which the Chlorans might be able to detect. He found the diamond-shaped ocean and the elliptical lake without difficulty, and placed his vessel with care. He then cut off his every betraying force and his ship plunged downward, falling freely under the influence of gravity.

Directly over the city Radnor actuated his braking rockets, and as they burst into their staccato thunder his



*Surrounded by a shell of energy, he was drawn toward  
the huge dome.*

hands fairly flashed over his controls. Almost simultaneously he scattered broadcast his cargo of bombs, threw out a vast hemisphere of force to confine the gas they would release, activated his spy ray, and cut in the generators of his awful offensive beams.

The bombs were simply large flasks of metal, so built as to shatter upon impact, and they contained only oxygen under pressure—but what a pressure! Five thousand Valeronian atmospheres those flasks contained. Well over seventy-five thousand pounds to the square inch, in our ordinary terms, that pressure was one handled upon Earth only in high-pressure laboratories. Spreading widely to cover almost the whole circle of the city's expanse, those terrific canisters hurtled to ground and exploded with all the devastating might of the high-explosive shells which in effect they were.

But the havoc they wrought as demolition bombs was neither their only nor their greatest damage. The seventy-five million cubic feet of free oxygen, driven downward and prevented from escaping into the open atmosphere by Radnor's forces, quickly diffused into a killing concentration throughout the Chloran city save inside that one up-standing dome. Almost everywhere else throughout that city the natives died exactly as had died the people of the Valeronian village in the strangling chlorine of the invaders; for oxygen is as lethal to that amebic race as is their noxious halogen ~~to~~ us.

Long before the bombs reached the ground Radnor was probing with his spy ray at the great central dome from within which Klynor Sibling's message had in part been sent. But now he could not get through it; either they had detected Sibling's beam and blocked that entire communication band or else they had already put up additional barriers around their headquarters against his attack, quickly though he had acted.

Snapping off the futile visiray, he concentrated his destructive beam into a cylinder of the smallest possible diameter and hurled it against the dome; but even that frightful pencil of annihilation, driven by Radnor's every resource of power, was utterly ineffective against that greenly scintillant hemisphere of force. The point of attack flared into radiant splendor, but showed no sign of overloading or of failure.

Knowing now that there was no hope at all of rescuing Sibling and that he himself had only a few minutes left in which to work, Radnor left his beam upon the dome only long enough for his recording photometers to analyze the radiations emanating from the point of contact. Then, full-driven still, but now operating at maximum aperture, he drove it in a dizzying spiral outwardly from the dome, fusing the entire unprotected area of the metropolis into a glassily fluid slag of seething, smoking desolation.

But beneath that dome of force there was a mighty fortress indeed. It is true that her offensive weapons had not seen active service for many years; not since the last rebellion of the slaves had been crushed. It is also true that the Chloran officers whose duty it was to operate these weapons had been caught napping—as thoroughly surprised at that fierce counterattack as would be a group of Earthly hunters were the lowly rabbits to turn upon them with repeating rifles in their furry paws.

But it did not take long for those officers to tune in their offensive armament, and that armament was driven by no such puny engines as Radnor's space ship bore. Being stationary and a part of the regular equipment of a fortress, their size and mass were of course much greater than anything ordinarily installed in any vessel, of whatever class or tonnage. Also, in addition to being superior in size and number, the Chlo-



ran generators were considerably more efficient in the conversion and utilization of interatomic energy than were any then known to the science of Valeron.

Therefore, as Radnor had rather more than expected, he was not long allowed to wreak his will. From the dome there reached out slowly, almost caressingly, a huge arm of force incredible, at whose first blighting touch his first or outer screen simply vanished—flared through the visible spectrum and went down, all in the veriest twinkling of an eye. That first screen, although the weakest by far of the four, had never even radiated under the heaviest test loads that Radnor had been able to put upon it. Now he sat at his instruments, tense but intensely analytical, watching with bated breath as that Titanic beam crashed through his second screen and tore madly at his third.

WELL IT was for Valeron that day that Radnor had armed and powered his vessel to withstand not only whatever forces he expected her to meet, but had, with the true scientific spirit and in so far as he was able, provided against any conceivable emergency. Thus, the first screen was, as has been said, sufficiently powerful to cope with anything the vessel was apt to encounter. Nevertheless, the power of the other defensive courses increased in geometrical progression; and, as a final precaution, the fourth screen, in the almost unthinkable contingency of its being overloaded, threw on automatically in the moment of its failure an ultimately impenetrable zone of force.

That scientific caution was now to save not only Radnor's life, but also the whole civilization of Valeron. For even that mighty fourth screen, employing in its generation as it did the unimaginable sum total of the power possible of production by the massed converters of the space flyer, failed to stop that awful thrust. It halted it for a few minutes,

in a blazingly, flamingly pyrotechnic display of incandescence indescribable, but as the Chlorans meshed in additional units of their stupendous power plant it began to radiate higher and higher into the ultra-violet and was certainly doomed.

It failed, and in the instant of its going down actuated a zone of force—a complete stasis in the ether itself, through which no possible manifestation, either of matter or of energy in any form, could in any circumstances pass. Or could it? Radnor clenched his teeth and waited. Whether or not there was a sub-ether—something lying within and between the discrete particles which actually composed the ether—was a matter of theoretical controversy and of some academically scientific interest.

But, postulating the existence of such a medium and even that of vibrations of such infinitely short period that they could be propagated therein, would it be even theoretically possible to heterodyne upon them waves of ordinary frequencies? And could those amorphous monstrosities be so highly advanced that they had reduced to practical application something that was as yet known to humanity only in the vaguest, most tenuous of hypotheses?

Minute after minute passed, however, during which the Valeronian remained alive within an intact ship which, he knew, was hurtling upward and away from Chlora at the absolute velocity of her inertia, unaffected by gravitation, and he began to smile in relief. Whatever might lie below the level of the ether, either of vibration or of substance, it was becoming evident that the Chlorans could no more handle it than could he.

For half an hour Radnor allowed his craft to drift within her impenetrable shield. Then, knowing that he was well beyond atmosphere, he made sure that his screens were full out and released

his zone. Instantly his screens sprang into a dazzling, coruscant white under the combined attack of two space ships which had been following him. This time, however, the Chloran beams were stopped by the third screen. Either the enemy had not had time to measure accurately his power, or they had not considered such measurement worth while.

They were now to pay dearly for not having gauged his strength. Radnor's beam, again a stabbing stiletto of pure energy, lashed out against the nearer vessel; and that luckless ship mounted no such generators as powered her parent fortress. That raging spear, driven as it was by all the power that Radnor had been able to pack into his cruiser, tore through screens and metal alike as though they had been so much paper; and in mere seconds what had once been a mighty space ship was merely a cloud of drifting, expanding vapor. The furious shaft was then directed against the other enemy, but it was just too late—the canny amorbus in command had learned his lesson and had already snapped on his zone of force.

Having learned many facts vital to the defense of Valeron and knowing that his return homeward would now be unopposed, Radnor put on full touring acceleration and drove toward his native world. Motionless at his controls, face grim and hard, he devoted his entire mind to the problem of how Valeron could best wage the inevitable war of extinction against the implacable denizens of the monstrous, interloping planet Chlora.

### XIX.

AS HAS been said, Radnor's reply to Siblin's message was unheard, for his ultraphones were not upon his person, but were lying disregarded in a corner of the room in which their owner had undergone examination by his captors. They still lay there as the Vale-

ronian in his cage was wafted lightly back into the space ship from which he had been taken such a short time before; lay there as that vehicle of vacuous space lifted itself from its dock and darted away toward distant Valeron.

During the earlier part of that voyage Radnor was also in the ether, traveling from Valeron to Chlora. The two vessels did not meet, however, even though each was making for the planet which the other had left and though each pilot was following the path for him the most economical of time and of power. In fact, due to the orbits, velocities, and distances involved, they were separated by such a vast distance at the time of their closest approach to each other that neither ship even affected the ultrasensitive electro-magnetic detector screens of the other.

Not until the Chloran vessel was within Valeron's atmosphere did her commander deign again to notice his prisoner.

"As I told you when last I spoke to you, I am about to land you in one of your inhabited cities," the amorbus informed Siblin then. "Get in touch with your Bardyle at once and convey our instructions to him. You have the sample and you know what you are to do. No excuses for nonperformance will be accepted. If, however, you anticipate having any difficulty in convincing your fellow savages that we mean precisely what we say, I will take time now to destroy one or two more of your cities."

"It will not be necessary—my people will believe what I tell them," Siblin thought back. Then, deciding to make one more effort, hopeless although it probably would be, to reason with that highly intelligent but monstrously callous creature, he went on:

"I wish to repeat, however, that your demand is entirely beyond reason. That ore is rare, and in the time you have allowed us I really fear that it will be impossible for us to mine the required

amount of it. And surely, even from your own point of view, it would be more logical to grant us a reasonable extension of time than to kill us without further hearing simply because we have failed to perform a task that was from the very first impossible. You must bear it in mind that a dead humanity cannot work your mines at all."

"We know exactly how abundant that ore is, and we know equally well your intelligence and your ability," the captain replied coldly—and mistakenly. "With the machinery we have left in the mine and by working every possible man at all times, you can have it ready for us. I am now setting out to explore the next planet, but I shall be at the mine at sunrise, twenty of your mornings from to-morrow. Ten thousand tons of that mineral must be ready for me to load or else your entire race shall that day cease to exist. It matters nothing to us whether you live or die, since we already have slaves enough. We shall permit you to keep on living if you obey our orders in every particular, otherwise we shall not so permit."

The vessel came easily to a landing. Siblin in his cage was picked up by the same invisible means, transported along corridors and through doorways, and was deposited, not ungently, upon the ground in the middle of a public square. When the raider had darted away he opened the door of his glass prison and made his way through the gathering crowd of the curious to the nearest visiphone station, where the mere mention of his name cleared all lines of communication for an instant audience with the Bardyle of Valeron.

"We are glad indeed to see you again, Klynor Siblin." The coordinator smiled in greeting. "The more especially since Quedrin Radnor, even now on the way back from Chlora, has just reported that his attempt to rescue you was entirely in vain. He was met by forces of such magnitude that only by

employing a score of force was he himself able to win clear. But you undoubtedly have tidings of urgent import—you may proceed."

Siblin told his story tersely and cogently, yet omitting nothing of importance. When he had finished his report the Bardyle said:

"Truly, a depraved evolution—a violent and unreasonable race indeed." He thought deeply for a few seconds, then went on: "The council extraordinary has been in session for some time. I am inviting you to join us here. Quedrin Radnor should arrive at about the same time as you do, and you both should be present to clear up any minor points which have not been covered in your visiphone report. I am instructing the transportation officer there to put at your disposal any special equipment necessary to enable you to get here as soon as possible."

The Bardyle was no laggard, nor was the transportation officer of the city in which Siblin found himself. Therefore when he came out of the visiphone station there was awaiting him a two-wheeled automatic conveyance bearing upon its windshield in letters of orange light the legend, "Reserved for Klynor Siblin." He stepped into the queer-looking, gyroscopically stabilized vehicle, pressed down "9-264-38"—the location number of the airport—upon the banked keys of a numbering machine, and touched a red button, whereupon the machine glided off of itself.

It turned corners, dived downward into subways and swung upward onto bridges, selecting unerringly and following truly the guiding pencils of force which would lead it to the airport, its destination. Its pace was fast, mounting effortlessly upon the straightaways to a hundred miles an hour and more.

There were no traffic jams and very few halts, since each direction of traffic had its own level and its own roadway,

and the only necessity for stopping came in the very infrequent event that a main artery into which the machine's way led was already so full of vehicles that it had to wait momentarily for an opening. There was no disorder, and there were neither accidents nor collisions; for the forces controlling those thousands upon thousands of speeding mechanisms, unlike the drivers of Earthly automobiles, were uniformly tireless, eternally vigilant, and—sober.

Thus Säblin arrived at the airport without incident, finding his special plane ready and waiting. It also was fully automatic, robot-piloted, sealed for high flight, and equipped with everything necessary for comfort. He ate a heavy meal, and, then, as the plane reached its ninety-thousand-foot ceiling and leveled out at eight hundred miles an hour toward the distant capital, undressed and went to bed, to the first real sleep he had enjoyed for many days.

AS HAS been indicated, Säblin lost no time; but, rapidly as he had traveled and instantly as he had made connections Quedrin Radnor was already in his seat in the council extraordinary when Säblin was ushered in to sit with that august body. The visiphone reports had been studied exhaustively by every councillor, and as soon as the newcomer had answered their many questions concerning the details of his experiences the council continued its intense, but orderly and thorough, study of what should be done, what could be done, in the present crisis.

"We are in agreement, gentlemen," the Bardyle at last announced. "This new development, offering as it does only the choice between death and slavery of the most abject kind, does not change the prior situation except in setting a definite date for the completion of our program of defense. The stipulated amount of tribute probably could be mined by dint of straining our every

resource, but in all probability that demand is but the first of such a never-ending succession that our lives would soon become unbearable.

"We are agreed that the immediate extinction of our entire race is preferable to a precarious existence which can be earned only by incessant and grinding labor for an unfeeling and alien race; an existence even then subject to termination at any time at the whim of the Chlorans.

"Therefore the work which was begun as soon as the strangers revealed their true nature and which is now well under way shall go on. Most of you know already what that work is, but for one or two who do not and for the benefit of the news broadcasts I shall summarize our position as briefly as is consistent with clarity.

"We intend to defend this, our largest city, into which is being brought everything needed of supplies and equipment, and as many men as can work without interfering with each other. The rest of our people are to leave their houses and scatter into widely separated temporary refuges until the issue has been decided. This evacuation may not be necessary, since the enemy will center their attack upon our fortress, knowing that until it has been reduced we are still masters of our planet.

"It was decided upon, however, not only in the belief that the enemy may destroy our unprotected centers of population, either wantonly or in anger at our resistance, but also because such a dispersion will give our race the greatest possible chance of survival in the not-at-all-improbable event of the crushing of our defenses here.

"One power-driven dome of force is to protect the city proper, and around that dome are being built concentric rings of fortifications housing the most powerful mechanisms of offense and defense possible for us to construct.

"Although we have always been a peaceful people our position is not entirely hopeless. The *sine qua non* of warfare is power, and of that commodity we have no lack. True, without knowledge of how to apply that power our cause would be already lost, but we are not without knowledge of the application. Many of our peace-time tools are readily transformed into powerful engines of destruction. Quedrin Radnor, besides possessing a unique ability in the turning of old things to new purposes, has studied exhaustively the patterns of force employed by the enemy and understands thoroughly their generation, their utilization, and their neutralization.

"Finally, the mining and excavating machinery of the Chlorane has been dismantled and studied, and its novel features have been incorporated in several new mechanisms of our own devising. Twenty days is none too long a time in which to complete a program of this magnitude and scope, but that is all the time we have. You wish to ask a question, Councilor Quedrin?"

"If you please. Shall we not have more than twenty days? The ship to be loaded will return in that time, it is true, but we can deal with her easily enough. Their ordinary space ships are no match for ours. That fact was proved so conclusively during our one engagement in space that they did not even follow me back here. They undoubtedly are building vessels of vastly greater power, but it seems to me that we shall be safe until those heavier vessels can arrive."

"I fear that you are underestimating the intelligence of our foes," replied the coordinator. "In all probability they know exactly what we are doing, and were their present space ships superior to yours we would have ceased to exist ere this. It is practically certain that they will attack as soon as

they have constructed craft of sufficient power to insure success. In fact, they may be able to perfect their attack before we can complete our defense, but that is a chance which we must take.

"In that connection, two facts give us grounds for optimism. First, theirs is an undertaking of greater magnitude than ours, since they must of necessity be mobile and operative at a great distance from their base, whereas we are stationary and at home. Second, we started our project before they began theirs. This second fact must be allowed but little weight, however, for they may well be more efficient than we are in the construction of engines of war.

"The exploring vessel is unimportant. She may or may not call for her load of ore; she may or may not join in the attack which is now inevitable. One thing only is certain—we must and we will drive this program through to completion before she is due to dock at the mine. Everything else must be subordinated to the task; we must devote to it every iota of our mental, physical, and mechanical power. Each of you knows his part. The meeting is adjourned *sine die*."

THERE ensued a world-wide activity unparalleled in the annals of the planet. During the years immediately preceding the cataclysm there had been hustle and bustle, misdirected effort, wasted energy, turmoil and confusion; and a certain measure of success had been wrested out of chaos only by the ability of a handful of men to think clearly and straight. Now, however, Valeron was facing a crisis infinitely more grave, for she had but days instead of years in which to prepare to meet it. But now, on the other hand, instead of possessing only a few men of vision, who had found it practically impossible either to direct or to control an out-and-out rabble of ignorant, muddled, and panic-

stricken incompetents, she had a population composed entirely of clear thinkers who, requiring very little direction and no control at all, were able and eager to work together whole-heartedly for the common good.

Thus, while the city and its environs now seethed with activity, there was no confusion or disorder. Wherever there was room for a man to work, a man was working, and the workers were kept supplied with materials and with mechanisms. There were no mistakes, no delays, no friction. Each man knew his task and its relation to the whole, and performed it with a smoothly efficient speed born of a racial training in co-operation and co-ordination impossible to any member of a race of lesser mental attainments.

To such good purpose did every Valeronian do his part that at dawn of The Day everything was in readiness for the Chloran visitation. The immense fortress was complete and had been tested in every part, from the ranked batteries of gigantic converters and generators down to the most distant outlying visiray viewpoint. It was powered, armed, equipped, provisioned, garrisoned. Every once-populated city was devoid of life, its inhabitants having dispersed over the face of the globe, to live in isolated groups until it had been decided whether the proud civilization of Valeron was to triumph or to perish.

Promptly as that sunrise the Chloran explorer appeared at the lifeless mine, and when he found the loading hoppers empty he calmly proceeded to the nearest city and began to beam it down. Finding it deserted he cut off, and felt a powerful spy ray, upon which he set a tracer. This time the ray held up and he saw the immense fortress which had been erected during his absence; a fortress which he forthwith attacked viciously, carelessly, and with the loftily arrogant contempt which seemed to characterize his breed.

But was that innate contemptuousness the real reason for that suicidal attempt? Or had that vessel's commander been ordered by the Great Ones to sacrifice himself and his command so that they could measure Valeron's defensive power? If so, why did he visit the mine at all and why did he not know beforehand the location of the fortress? Camouflage? In view of what the Great Ones of Chlora must have known, why that commander did what he did that morning no one of Valeron ever knew.

The explorer launched a beam—just one. Then Quedrin Radnor pressed a contact and out against the invader there flamed a beam of such violence that the amorphous had no time to touch his controls, that even the automatic trips of his zone of force—if he had such trips—did not have time in which to react. The defensive screens scarcely flashed, so rapidly did that terrific beam drive through them, and the vessel itself disappeared almost instantly—molten, vaporized, consumed utterly. But there was no exultation beneath Valeron's mighty dome. From the Bardyle down, the defenders of their planet knew full well that the real attack was yet to come, and knew that it would not be long delayed.

It was not. And the ships which came to reduce Valeron's far-flung stronghold in no way resembled any form of space ship with which humanity was familiar. Two stupendous structures of metal appeared, plunging stolidly along, veritable flying fortresses, of such enormous bulk and mass that it seemed scarcely conceivable for them actually to support themselves in air.

Simultaneously the two floating castles launched against the towering dome of defense the heaviest beams they could generate and project. Under that awful thrust Valeron's mighty generators shrieked a mad crescendo and her imponderable shield radiated a fierce, eye-tearing violet, but it held. Not for

nothing had the mightiest minds of Valeron wrought to convert their mechanisms and forces of peace into engines of war; not for nothing had her people labored with all their mental and physical might for almost two-score days and nights, smoothly and efficiently as one mind in one body. Not easily did even Valeron's Titanic defensive installation carry that frightful load, but they carried it.

THEN, like mythical Jove hurling his bolt—like, that is, save that beside that Valeronian beam any possible bolt of lightning would have been as sweetly innocuous a caress as young love's first kiss—Radnor drove against the nearer structure a beam of concentrated fury; a beam behind which there were every volt and every ampere that his stupendous offensive generators could yield.

The Chloran defenses in turn were loaded grievously, but in turn they also held; and for hours then there raged a furiously spectacular struggle. Beams, rods, planes, and needles of every known kind and of every usable-frequency of vibratory energy were driven against impenetrable neutralizing screens. Monstrous cannon, hurling shells with a velocity and of an explosive violence far beyond anything known to us of Earth, radio-beam-dirigible torpedoes, robot-manned drill planes, and the many other lethal agencies of ultra-scientific war—all these were put to use by both sides in those first few frantic hours, but neither side was able to make any impression upon the other. Then, each realizing that the other's defenses had been designed to withstand his every force, the intensive combat settled down to a war of sheer attrition.

Radnor and his scientists devoted themselves exclusively to the development of new and ever more powerful weapons of offense; the Chlorans ceased their fruitless attacks upon the central dome and concentrated all their offensive power into two semicircular arcs, which they directed vertically downward upon the outer ring of the Valeronian works in an incessant and methodical flood of energy.

They could not pierce the defensive shields against Valeron's massed power, but they could and did bring into being a vast annular lake of furiously boiling lava, into which the outer ring of fortresses began slowly to crumble and to dissolve. This method of destruction, while slow, was certain; and grimly, pertinaciously, implacably, the Chlorans went about the business of reducing Valeron's only citadel.

The Bardyle wondered audibly how the enemy could possibly maintain indefinitely an attack so profligate of energy, but he soon learned that there were at least four of the floating fortresses engaged in the undertaking. Occasionally the two creations then attacking were replaced by two precisely similar structures, presumably to return to Chloran in order to renew their supplies of the substance, whatever it was, from the atomic disintegration of which they derived their incomprehensible power.

And slowly, contesting stubbornly and bitterly every foot of ground lost, the forces of Valeron were beaten back under the relentless, never-ceasing attack of the Chloran monstrosities—back and ever back toward their central dome as ring after ring of the outlying fortifications slugged down into that turbulently seething, that incandescently flaming lake of boiling lava.

*To Be Continued.*

# Let's Get Down to BRASS TACKS



AN OPEN FORUM OF CONTROVERSIAL OPINION

## Challenge

Dear Editor:

In connection with my story *The Inevitable*, there is a story. It concerns the fine line one can have regarding that gentle little limitation on a man who teaches, really understands, or in any way enjoys physics.

To say a one physics is very dear and very close to his heart, and when some one inadvertently strikes a finger through the cracks of his solid armor, then must be free to defend and show the error really is solid, without cracks. I showed that thing to such a man.

"Way," said he, "this is impossible. Don't you see that this would violate the law of conservation of energy?"

Immediately I admitted I did so—but that to make it conform to the law of conservation of energy, then something must be done about some half dozen other laws along the way. It seemed to me.

In other words, if work is defined as the force times the distance through which it operates, then something new must be done about the law of conservation of energy—because the law of nature states there is no absolute velocity given you to fight to maintain a space ship's velocity relative to Earth, or any other planet when calculating the work it is doing, since that is dependent on the velocity of the ship.

This problem, so far as I can see, remains despite the saddest attempts to solve it. As Karl Barad says, we can go right on breaking the law of conservation of energy until the official customer turns up.

And this problem has remained the dark-bellied stepchild of physics since I first sprang it as a brothered physicist. Being a chemist myself, I do enjoy things like that. Those physicists have such funny ideas about atoms, their atoms won't even make common water, yet they look with disdain at a chemist's atomic theory, which will at least do that. The pot is calling the kettle black, I maintain. Anyway, it's fun to watch one of my physicist friends start off confidently to demolish that fantastic thing—and wind up bawling and leaving.

And I've had them come back three weeks later, the thing having rattled like a cat-bow in their minds, with an explanation. Really they depart.

Somewhere there may be an answer. Please, Mr. Editor, and readers, if you know it, send it in. Many friends of mine will be spared untold agony of mind if you can prove this is wrong. And—I'll admit it. The thing's got me going. If the thing's possible on a microscopic scale, then why not on the macroscopic of the atom? May chemistry meet some such problem, too!—Karl Van Cuyper.

## Physics

Dear Editor:

Before I forget it, may I point out with respect to Mr. Kelly's defense of *Order 17*, that a thousand miles per hour is not an acceleration, but a velocity? The general expression for dimensions of units of acceleration is

$$\frac{L}{T^2}$$

where  $L$  represents any unit of length, and  $T$  any unit of time. The units usually used are the foot and the second; for example, twenty feet per second per second. From a glance at the story itself, it is evident that the word Mr. Kelly intended is velocity. I do not remember any such misstatement in the story, which seemed to me well written and enjoyable. I think it did what Mr. Kelly says he attempted.

What others have said about the thought-provoking quality of *Brass Tacks* is quite true. When I read Mr. Donald Freeman's letter, my first thought was that he was just plain nuts. Then I got to thinking, which led to getting out my old Physics text and re-learning a few things. There is a fallacy in his theory, however. It is the statement that "The speed of the fall is proportional to the combined mass of the two objects." The force acting, and not the speed of the fall, is in direct proportion to the product of the two masses, according to the formula,

$$F = G \frac{m_1 m_2}{r^2}$$

where  $F$  is the force acting,  $G$  is a constant, called the constant of gravitation,  $m_1$  and  $m_2$  the two masses, and  $r$  the distance between them.



G has been determined as being  $6.8579 \times 10^{-2}$  in the c. g. s. system. While the force is greater on a larger mass, we find from the equation  $F = ma$  that the acceleration varies inversely as the mass and directly as the force:

$$a = \frac{F}{m}$$

Let us suppose that  $m$  is the mass of the falling body, and  $m'$  that of the earth. Setting the two equations for  $F$  equal to each other, we have:

$$ma = G \frac{m m'}{r^2}$$

$$\text{or, } a = G \frac{m'}{r^2}$$

Since  $G$  and  $m'$  are constant, the acceleration of gravity, usually expressed by  $g$  instead of  $a$ , varies inversely as the square of the distance between the center of the falling body and the center of the earth. Thus the mass of a falling body has no effect on its acceleration. As a matter of fact, when Galileo dropped two cannon balls of different sizes from the Leaning Tower of Pisa, he found that the heavier one fell very slightly faster than the smaller. He explained this by saying that the air friction on the smaller is relatively greater than on the larger, and this is the accepted explanation.

I hope, Mr. Francon, that this will explain why your theory is not true. I thank you for it, though, for if it has done nothing else, it has made me review some facts I had forgotten and born a few I never knew before.—William M. Lauer, 8843 Thomas Boulevard, Pittsburgh, Pennsylvania.

### Concerning Fantasy Magazine

Dear Editor:

The editors of Fantasy Magazine wish to congratulate the editors of *Ascending Stories* for the good work they are doing in bringing science-fiction up to such a high standard as they have done during the past year. It's truly wonderful. Science-fiction was slowly falling into a rut, stories were getting worse, good authors felt no urge to write science-fiction, and it seemed inevitable that science-fiction would soon die for lack of readers—when along came *Ascending Stories* and gave us stories and authors that made us want to stand up and cheer. Keep up the good work.

Incidentally, a word about Fantasy Magazine. Many *Ascending Stories* readers have often asked the editors for more details and personal news concerning the authors and future stories to appear in the magazine, or others. It isn't fair to take such valuable space from A. S. for this information. To take care of this need Fantasy Magazine, a science-fiction "Tab" magazine, was started, and it gives all this information. You will know months in advance what stories will appear in this magazine! In addition, we feature interviews with your favorite authors, including such names as Donald Wand, Edward E. Smith, Murray Leinster, Harl Vincent, Charles William Dille, and several others.

Our current number is dedicated to *Ascending Stories*. Readers of this magazine will especially enjoy this issue. It will be mailed free to any one who asks for it.—Julius Schwartz, 87-38 162nd Street, Jamaica, New York.

### Call For Mr. Campbell

Dear Editor:

For the first time since the new *Ascending Stories* started up I have some criticism for you. Most of it is directed against the thought variant for October, *Isobars*. The author may be a better to *Brass Tacks* than I took him several months to write this story. Well, if he'd have taken a few extra days and looked it over carefully, I

think he would have been able to better it considerably. In the first place, that is the third story of this sort that has appeared in *Ascending* in the last five issues. The first, *Isobars*, to *Isobars*, was fair and the rest one wasn't so terribly bad; but having three in a row is too much. True, they have several differences, but they are quite similar. Now to errors in *Isobars*.

(1) Page 14, near the bottom of the first column: "It is particularly good chance of his landing in one place at *Isobars*, a distance of twenty-five thousand miles from San Francisco." Since when has the distance between these two places become so great, may I ask? He might have detoured, but as he was flying a non-stop flight, he would probably have flown a moderately straight course.

(2) I fail to see how a three-dimensional and a four-dimensional man would have any effect upon each other when they collided. Just how could they collide? I'd like for the author to clear up this point if he doesn't mind.

(3) In section seven it says that the scientist Miller had been beaten by several months when he turned in his data on the dimension. The category was apparently instantaneous in all parts of the world. Well, Miller had only taken a couple of three days to collect his data; so how the heck could they have beaten him by months?

(4) That part about all life that had ever existed being arrived didn't go across either. That's against religion, science, logic, or what have you. I don't know much about such things but it seems to me that the molecules of the creatures that have lived and died hundreds of years ago have been used in building the bodies of the creatures that are alive today. If this is the case, how are you going to get them separated into their own bodies? And, another thing, it seems to me that the prehistoric monsters would have killed people more than they seemed to have in the story. And how about those knights who had their armor on when they were brought to the present? What if their said swords, or others, had been melted and made into something else? Is he going to have a body change two thousand of the same time? If so it is at least a little different from having two bodies occupy the same space. But he certainly made a mistake about having all life brought back. Take that, for instance. They and their ancestors have been with us for centuries; and with such a large number of generations of them back all at once, good night! To say nothing of the grandmothers, wild animals, birds, cats, ivywood, and all the other creatures. Talk about being crowded; that would be a full little old world.

Back to other things for a while. I certainly am being disappointed in *Isobars* of *Valerius*. I heartily wish it had never been written. It does not compare with the other two. The *Bright Illusion* is the best story in the October issue so far. It certainly is "different."—Lancel Dulbeck, 1384 Gold Street, Wichita, Kansas.

### For Dr. Smith

Dear Editor:

Your announcement in the October issue stating that you had awarded Campbell's latest serial, proves the worth of *Ascending Stories*. First Dr. Smith and now Campbell. If that isn't smothering the wind out of the competing editor, I don't know what it is. Why with both these authors writing in one issue, it doesn't even seem possible that there can be any doubt as to which science-fiction magazine to buy. Our October issue was great, probably the best so far. However, don't think you can get off easily with compliments. Here goes for a few criticisms.

My first refers to *The Shards of Valerius*. When Smith, Crane Dearth and Margrave covered the fourth dimension in a space ship, there was a slight gravitational pull aboard. In fact, to quote Dr. Smith—"for the shards

had been given an acceleration, barely enough to make the floor of the control room come down."

Also, when Beaton and Margrave made their escape, they were able to walk under water. Partly because of their weight on the planet and partly because of the slight density of the water. This proves that, according to Dr. Smith, there was some gravity on the planet of the fourth dimension. Moreover, when Beaton reached "the rim of the tub" and was able to extract himself, this proved again, according to Dr. Smith, that three-dimensional matter was not added to hypertime. Now, since there was a force of gravity in hypertime, and three-dimensional matter was not added, what was to keep Beaton, Crane, and the others from falling through the bottom of the ship, where there was a force of gravity sufficient to pull them down?

My second and last briefest refers to *Je-Sau-Vous*. In this story, the author tries to make it clear that time ceases to exist. That people who already have been dead, come to life again. Moreover, in one part of the story, he tells of how men wanted to start Lincoln and Washington as president. In various other ways to tell and make it quite clear that it is possible for dead men to return to life. All the centuries of past, present, and future, are living in one age. Here the dead have risen to life, that is those who had lived and died in the past, men are now immortal. Yet the author constantly speaks of wars in which men of the past, present, and future, are being slaughtered! All they have to do is merely come back to life again in the same manner as when the catastrophe occurred!

On the whole, however, the three stories I repeat were one of the best this year. The only thing you lack is a quarterly, and the answering of letters in *Brain Trust*.—Irving Kasso, 3415 Fulton Street, Brooklyn, New York.

### "Old Friend"

Dear Editor:

As the best editor of the best magazine you might be glad to hear the opinion of a boy field engineer who has read *Astounding* since the very first issue. Now that you have put your individuality and personality into *Astounding* it is no big that I sometimes have to lay down important things to get enough time to read it through.

I travel here and there with this and that research crowd but I can always get *Astounding* mailed to me from my neighborhood in the old New York neighborhood and when I get home I always have our friend waiting for me. I pick the old friend up at the news stand and am lost to civilization and society until we have had our evening. I am satisfied that you have made *Astounding* much better and more astounding.

Some of the best stories were published away back but they were as better than some of the masterpieces of your choice. In your day, the best have been, in the order named, *Le' Colosseum*, *Arctoth*, and *Lyrion of Space*. My favorite authors are Earl Vincent, A. Merritt, Jack Williamson, and all others except Schuchman, Zagar, and Hains. I do not care for these three, but after all I am only one reader.

Bates drew a "bump" out of me when he turned as everytime back on a mailed the notations of such food without getting a better explanation. That was astounding. Bates should know that before the metal noticed the expanding steam would have blown the miniature men to wherever miniature men go when they fall apart.

I decided I was of Bates for life but then my favorite fell to H. T. Thorne, who in Jack Williamson, pulled just as bad a horse. He had the ghost birds hatched from planet eggs, "flying away through space." Just what did those plant birds push their wings against? So—I had to forgive Bates.

May I tell all authors that diamonds in the rough do not scintillate? A diamond which "dropped from the ether" or was "found in the side of a mountain" does not reflect any light

whatever stuff it was cut. This fact would remain a fact even if the diamond was as big as the mountain. I have read at least three stories about "blinding, dazzling, scintillating diamonds." All these diamonds were left hard by the authors.

Be careful, you authors, how you handle radium radiation. The chemists, metallurgists, and doctors themselves do not understand them. The M. D.'s are "warning" cancer patients by telling their bones with radium. This makes just as certain and sure the patients' deaths from radium poisoning. It is curious that radium poisoning and phosphorus poisoning act identically. Remember the "phony M.V." disease of the old-time match workers? Lead poisoning, in some ways, is similar. It rots and "twists" the bones. Lead and radium are related but what, if any, is the relation between radium and phosphorus?

There was a heavy right at the conclusion of *Wood of Creation*. I wonder how many spotted it. I was of *Lester for Murder Madness*, but he redeemed himself with some excellent stories later.

Your magazine is a mine of ideas for all engaged in research. Great minds, thank authors.—J. C. Thacker.

### "The Most Practical Field"

Dear Editor:

I love your (our) magazine, in spite of the same, which lacks dignity and it appreciates me to have any one make secondary remarks about the type of literature in which I lose myself in fond dreaming.

I, as an average reader, am very much in favor of stories that are not too fantastic. Science-fiction means (to me) the elaboration of present and presumed facts, and every fact has its explanation. The majority of *Astounding's* authors are prone to become too technical in their explanations, although I realize that there is a large number of readers who might on details, but they have their proper place.

It makes me angry for an author to invent a marvelous X metal without any reason. Science-fiction writing is a serious business, and should be considered as such. It means as much to this age as the philosophy of the ancient world to our present-day philosophers. Philosophy is the scientific probing of the mind, and our new form of literature, which has no name as yet, which we call science-fiction, is actually physical science-fiction, meaning the progress of our physical sciences. It is the most practical field of writing ever attempted by man.

The mental picture must precede the physical result, which means that there is being developed a great number of "vibrators" within the youthful mentalities of the young men of America. I expect to live to see a new race of inventive geniuses arise, during my lifetime, as a direct result of the new form of literature.

I, too, am a dreamer, and I much prefer the "perfect future" to the "world present," but I believe there is a great desire for our practical fiction.—Chas. Lewis Marks, 1607 Broadway, New York City.

### The Mc-Wanton-Quarterly Tribe

Dear Editor:

Mr. Bates at World's Fair, but me come from big reservation up north. Leavens spent long with English at government school. World's Fair big astounding story! No person *Astounding* Stories up north, but here in Chicago long plenty of fun. Random all know for last many moon. Gettin lotta happiness. Dream of happy beating grounds.

Did makem me think of picture grand father to me drawn on buffalo skin. Also, *Astounding* show last the long rushing waters in rough rapids. Bullhorn!

Me laugh big gals at "Second Spectrum. Grandmother to me tell me same story many times. Many many moons ago. Also, no wonder long mark where are that breath of Great Spirit in your book—poetry? Me lookum mark, but no know. Ugh!—Chief Mc-Wanum-Quarterly, Century of Progress, Chicago.

### Does Any One?

Dear Editor:

I wish that you would publish this in Brass Tacks, because I have several copies of the previous Sklar's stories that I would like to dispose of. Any one desiring these copies in the original magazine can get to touch with me—Harry Bennett, 1433 East 36th Street, Chicago, Illinois.

### Trade

Dear Editor:

Congratulations on your September issue. I see there is a demand for the previous Sklar's stories. I have *The Sklar of Space* (in good condition) and, if I can trace who at present has it "on loan," Sklar's *III* (mine covers). I am willing to trade these for science-fiction novels or serials but not from any of the present three science-fiction magazines, as I have read them all from the beginning. Any one interested could write me. I have read glowing accounts of some of the older stories such as *The Out in the Golden Age*, but have never come across any of them, but any story will do as long as it is good.—W. A. Gibson, Knoxville, George Street, Rathgale, West Lethbridge, Scotland.

### Salt-water Frogs Again

Dear Editor:

I have just bought the October issue of *Amazing Stories* and wish to say that I think it was right up to the mark as the September number—a couple of notches ahead, if anything. You're right for the post!

I was interested in Mr. Smith's letter asking what salt-water toads and frogs look like. I take it that Mr. Smith doesn't think that *Drops* live in salt water. Well, he's absolutely correct. But, what I want to know is, does a water spout to be a water spout have to pass over salt water? I don't think so. It seems to me that one could just as easily pass over a fresh-water lake where frogs and toads do breed, and pick them up.

As for the next to the last paragraph in his letter—it's a common occurrence in the spring of the year to see swarms of young frogs leaping about the ground near a supply of water after a thunderstorm.

But to get back to the October *Amazing*. I think Howard Brown did his best work yet on the cover and I was glad to see C. L. Moore on your list of authors. There's a rubbing good story, better. I have John W. Campbell's story, *The Nightbird*, which, to better than the title suggests.—Robert R. Taft, 61 Rainbow Avenue, White Plains, New York.

### "Most Thought-variant"

Dear Editor:

*Jaques* was one of the most thought-variant stories I have ever read. It was magnificently written. The Campbell seems to have a knack of doing that.

The whole thing centers around "What year did it happen to?" To a person living in the 18th century it happened in the 18th century. To a person living in the 20th century it happened in the 20th century. To a person living

in the 25th century it would happen in the 25th century. Therefore, it must have happened simultaneously in all of these different times. Now, if it happened in the 18th century, dissemination would have stopped then, and we would not be here now. If it happened in the 20th century, dissemination would have stopped now, and there would be no future. Hence, where do you get the people from the future in the story? The least that could happen would be that it would have left some sort of mark on history, and we have nothing like that.

Another point, Mr. Campbell greatly underestimated the amount of people that were on the earth after the catastrophe. Overcrowding isn't the word for it. They would have been packed too deep around the world like sardines in a can. Otherwise, the story was good.—William A. Rothman, Director of Philadelphia Science Fiction League, 2308 North 34th Street, Philadelphia, Pennsylvania.

### First Letter

Dear Editor:

Although I have been a reader of *Amazing Stories* from the first issue, this is the first time I have expressed my opinion in a letter. My reason for doing so is the untimely conclusion of the October number in which not only one or two stories, but all of them are of unusual interest.

First place is taken by *The Bright Illusion*, one of the most unique stories ever published. You will probably receive a lot of letters objecting to it, on the ground that it's not science-fiction, but don't let that worry you. We're going to *define* science-fiction!

*Jaques* was a great story, but I don't see why you labeled it as a thought-variant. Too similar to *Skinner* in *Time*.

*Men of Ages* was outstanding among the short stories. I'm having a hard struggle to keep from reading the Sklar's each I get all the instantaneously.

Keep Ray Cummings away from *Amazing Stories* and don't acquire Weism. Why not revive *Strange Tales*?—James Francis Dolan, 2808 Baker Avenue, Uxma, New York.

### "Don't Trim"

Dear Editor:

Starting this letter with a bouquet I designate (the great grates)—science one—(stupid science), Mr. Lamar Worthington, to wit:

"I know not what the rest of your readers think of *Amazing* issues, but to myself I find it much like child playing on the machine (at Atlantic City); now finding some people rather more polished, and now some rare shall more beautifully variegated than another, and sometimes finding a diamond ring in the seaweedly wandering what greater things than infinitesimal discoveries might lead to when he is old enough and able to explore the great ocean untroubled before him."

Then it is with *Amazing* stories. Most of the stories are good, although rather more beautiful than the other made on the market, and some of them are perhaps polished more than others, while now and then we, the readers, find a shell more beautiful than the rest, viz: *Calculus*, *The Legion of Space*, *The Sklar of Future*, of course, and then sometimes a diamond ring, such as *The Bright Illusion*, *The Lovely Ghost*, *Short-story Castle*, of course.

Strange characters? Exactly.

And for the ocean—coming achievements in the various fields of science.

Now then—

I could fill several pages with requests, comments on good stories, criticisms, praise, and so forth, but I have neither the time nor inclination to do so.—J. W. W.

Charles Fort's *Lo!* seems to me to be the greatest thing any science-fiction magazine has done

so far. I am sorry to see it end. Isn't there another like book by Mr. Fort which you might reprint? I can imagine what Mr. Fort would have said of the recent one tragedy; something like this: "Lightning did not strike the Torre Castle because the Torre Castle was not where the lightning struck. What?"

I thought R. W. Wagon was THE artist in the field of science-fiction illustrations and I must hold such along with Wagon to be in the class. Duff's illustrations are simply superb.

About receiving these three readers for you: I hope I've done better than that. As I work at a service station I usually leave several copies of Astounding Stories laying around where they will be sure to find them. Quite a number of them have been walked away with, so I hope I have satisfied my readers. I know one, however, and I believe you will receive his subscription soon; a Mr. Xant Athla, Zone of Chon, Egypt. I sent him a pile of old issues I had recently.

I do not agree with H. E. Brown of Newburyport, Massachusetts. What he thinks Astounding Stories should be is a well-thought of advanced science fiction magazine, and with the story in hand nothing is the intention. Now, Mr. Editor, if this is so, why not put out another magazine that generally (except for the) containing only those stories of fantasy wherein the author may go to any limit; and in it print such scientific stories as was The Bright Illusion, or even, where you suggested scientific facts of theories.

I never even bring home his release. I thank Mr. H. V. Brown for a number of F. S. A. I would almost believe the cover for the late August issue was a retouched photograph. What did Mr. Thompson say? "The photograph was." That's it, exactly. The original for Columbus cover should hang in the Louvre—undoubtedly, indeed.

Catch this one! Do not start trembling the editor! When you receive a serial and think it, then it is in the end a great thing. This could not be done very handsily if the editor were all over. The untimely margin in O. E. for me. Do and from it—Joseph Hatch, 204 Mahan Lane, Lawrence, Kansas.

### It Was A Hard Thing To Explain

Dear Editor: Since May, 1935, I have been reading Astounding Stories with great pleasure. The old magazine was quite mediocre, but since I had been able to choose from, I thought it was all right. In the latter days it became little better than a fantastic blood-and-thunder adventure magazine. Nevertheless, when I heard that it was having the new masthead, I was sorry.

And then I learned through Fantasy Magazine, that Street & Smith was retitling Astounding to the market. Needless to say, I purchased the initial issue and all thereafter. It is not necessary for me to say that Astounding now leads the field of science-fiction because most of your readers have already expressed themselves on that point.

The reader's department is the only really good part in the magazine. I guess by this, that almost all of the letters are about the same thing, but in different words. This is not only understanding, but humorous. I think you can remedy this by omitting letters which have nothing to say. I believe that a reader can best tell you what stories he liked best if he will give you a discussion on the theories presented in the story. By just saying that "This story is good" and "I liked this one" he is merely saying nothing. Why be liked it is what the other readers want to know.

And now about the thought-variant story. I believe, I don't know what to say about this well-written, thought-twisting narrative. I think Mr. Campbell was well advised when he said in his letter to Bruce Tuck that this was the best thought-variant he would attempt. No

wonder the writing of this story nearly drove him insane. Do you remember what Einstein said in the current *Scientific American* in talking to Margaret? He said: "Remember that our brains and eyes, are really pseudo-fourth-dimensional, are capable of seeing these things as they actually are; but that our ordinary intelligence—whatever you like—are still three-dimensional and can neither comprehend nor describe them. We can grasp them only very roughly by translating them into our own three-dimensional concepts, and that is a poor substitute that falls entirely to convey an approximate idea." If Einstein, whose brain and eyes were fourth-dimensional, couldn't describe what he saw, how could Langer's three-dimensional mind describe to Wething what he saw? Such things are beyond the comprehension of three-dimensional beings.

For almost two years now, I have subscribed to Fantasy Magazine and it has been the source of much enjoyment and information to me.

Yours for a bigger, better, and more successful Astounding Stories—Clay Ferguson, Jr., 225 Park Street, S. W., Roanoke, Virginia.

### Southern Courtesy

Dear Editor:

Allow me to hand you a bouquet of American literature. What a magazine! I have just finished the October issue of A. S. and Earl Vincent's *Cosmic Flight* makes all my grins. A scientific magazine—well, it was plenty good. I couldn't even get the drift of *Indefinite*. The *Bright Illusion* was extra good (and extra good for Astounding, but extra good as stories go). All the short stories were good.

I'm not kidding at all about Astounding, certainly not about such trivialities as rough edges. If Astounding was printed with white-hot iron, I'd prefer to sit on it, on my back shelf, and not read it. I read Astounding Stories, and I'd still be smothered with friends wanting to borrow copies, too.

We, down South, like your magazine, huh. Now, if you can find room, just print this, and I'll be right obliged.—Edward McKay, 2008 McCall Street, Charlotte, North Carolina.

### More!

Dear Editor:

Astounding Stories, what a magazine! October, what an issue! *Indefinite*, what a story! C. C. Campbell, what an author!

If C. C. Campbell gave stories as well written as *Indefinite* was, let's have plenty more of them.—Fred Thompson, 1220 North 28th Street, Philadelphia, Pennsylvania.

### We Have "Peaceful" Stories Very Often

Dear Editor:

In reply to Donald Freeman, of Chicago, I Bruce Tuck in your October issue, I should like to say that he has the right idea in his theory of gravitation. Newton's law of gravitation states, "Any two bodies in the universe attract each other with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers." Where M and m denote the two masses, d the distance between them, G the unit of attraction (that is, the gravitational constant  $6.6 \times 10^{-8}$ ), and F the force of mutual attraction, then,

$$F = G \frac{Mm}{d^2}$$

So you see, D. F., you were right about the earth pulling a heavy object with greater force than a light one.

As far as the stories go, both in quality and in quantity, I think *Amazing Stories* is the best magazine on the market. However, although the stories are the best to be found, I do not believe they are the best that can be written, especially if Smith, Campbell, and Coblentz would set themselves the task.

In all science-fiction stories have to be of war, or world disaster, or space pirates, or cosmic collisions, or atoms? Can't you have a powerful story now and then? If science-fiction portrays the possible future, I'm glad to be sure 500 years too soon. Other magazines, and with large circulations, too, mind you, print powerful stories of the past and present, so why don't you print those of the future?

I remember the first science-fiction magazine I ever read was an *Amazing Stories*, and now that it has improved so much, I have come back to it to stay until it goes down again, which defines I am no cosmic fan.

How about making this letter a Brass Tack? I would like to hear other readers' comments.—Philip Bunkel, Box 24, Morehead State Teachers College, Morehead, Kentucky.

### From Australia

Dear Editor:

If you can spare me a little space and time, I would like to give a few compliments on the splendid way you are improving *Amazing Stories* each month it appears.

As an old reader, I can say that *Amazing Stories* is better than it ever was in the past. I live in Melbourne, and my magazine comes about thirty-seven cents to buy, almost the price of two for one, but still it's worth buying.

Can you insert this in Brass Tacks, as I want to obtain back numbers of *Amazing Stories* 1930-31. If any readers have any to dispose of, will exchange other science-fiction or say. All letters sent to me will be answered.

Keep up the standard.—Marshall L. McLean, 7 Pitt Street, East Brunswick, North 24, Melbourne, Victoria, Australia.

### Thanks To Campbell

Dear Editor:

Although I've read your magazine for several years now, I have never written to before, being content to enjoy the stories and observe the critical comments of other, more forward, readers.

Allow me to say, however, that as a mere dabber in science and metaphysics, I had such food for speculation in a story by your October issue, by Clyde Crowe Campbell, when I began to be a devotee of your work. To me, the scientific data appeared particularly well grounded, though I do not pretend to be especially capable of judging such complex material. On the literary quality likewise, I must remain almost silent, though it seemed to me to be a powerful, moving story of action on a gigantic scale. Only Wells could have handled so well the chaotic confusion created by *Infusoria*.

But that which moved me most in the story, was the profound metaphysical speculation to which it gave rise. As in a revery, I could envision *Infusoria* as a vast, towering, ethereal land where peoples of all climes, nationalities, and creeds live in ill-measured harmony. Only the benign influence of an Almighty Being could have prevented these people from clashing, as they did in *Infusoria*. Yet it seems to me that the earthly hordes would survive death, store they have for so long been bred in the heat of antagonistic nations—bred into the very seed—into the very breath (aptitude) of man. It has become the staff of life, upon which his existence leans. Hate, instead of love, is the controlling influence of life.

I do not believe this powerful hypothesis feeds

its growth only in my imagination. Such a canvas, of so great a magnitude, could have been envisioned only with intent aloofness: it could not have been a mere by-product of science-fiction, but carefully blended instead with a prophetic imagination.

Thanks to Mr. Campbell for fortifying my shaking belief in a life after death. There is a welcome calmness as after a storm.

The handling of tough pages is more than overbalanced by the exceptionally fine quality and quantity of the stories you have presented on to date. I have no hint coming up that week. *Infusoria* of Valerius is coming along fine so far.—Oswald Fargher, 173 South Germania Street, Brooklyn, New York.

### Phew!

Dear Editor:

A few words about *The Bright Shadon*, while its impression on me is fresh. I consider this, by far, your outstanding story in the October issue. Many of your readers will, I know, disagree with me, and probably they will be right when they say it did not belong in *Amazing Stories*. There is not a fragment of science in it. Nevertheless, the story values as an speculative that it would not have been out of place in any magazine. Mr. Moore has created here a powerful story from material which might easily have been unimpressive, or even laughable. He has created a CHARACTER and endowed it with reality. He has painted the depths of feeling and suggested a glorious, high-minded love. I love it him.

I'm afraid Mr. Starn to guilty of minor-league plagiarism in *Simulation of the Cosmos*. A number of years ago, a story nearly identical with this appeared in another magazine. I do not recall its title, but it concerned communication between the planets.

The *Shadon*, as Mr. Joseph Robinson says, "has gone too far." But I was not disappointed in it. I know that the best of the stories is always the best, as I did not report *Br. Smith* to better the best *Shadon*. I am very glad you have rescued Campbell. His scientific outlook will lend a welcome variety to the magazine. He has, too, developed into an excellent writer; however, both Smith and Campbell are true and were-out plots. They should strive for more originality than, as well as to the scientific accuracy of *Br. Smith*.

*Infusoria* is quite good, but the difficulty of keeping such stories connected is enormous. As for myself, I feel that if I was in the *Infusoria* dimension, it would still be impossible to turn an orange inside out without breaking the skin, or to walk "around" a closed door, between all these objects would also be fourth dimensional. True, you could walk "around" a three-dimensional door, just as we can walk around a two-dimensional diagram, but such an object would be invisible, just as a two-dimensional object would be invisible in our world. Show me any object which you say has only two dimensions, and I will show you that it has three—say, four; length, breadth, depth, and a definite existence in time. Therefore, if two-dimensional objects exist—and if four-dimensional objects are possible, then why not the other two? If I say, two-dimensional objects exist, they are impossible to our senses. So would three-dimensional objects be impossible to a fourth-dimensional being, and his four-dimensional home would be as invisible to our own senses, in other words, he could go more with "past" or "around" a closed door than can we.

Phew! That was a long-winded one! I hope I have made myself clear? I'd like to hear some authoritative opinion on this subject.

Let me end my vote decidedly against *Infusoria*. The make-up of the magazine suits me, for I know that when the editor rag afford to do so, he will improve it still further. Mr. Editor thanks for continued improvement! I'm ENJOYING a regular diet of science-fiction ever more.—J. L. Wink, 7817 East 82nd Avenue, Chicago, Illinois.

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MEN KNOW:**

"Camels are made from the  
MOST EXPENSIVE  
TOBACCOS—Tobacco  
and Cigarettes—these superior  
quality brands."



**MRS. CHARLES DALY,** housewife, says: "Camels pick up my energy ... and have a delicate flavor that a woman likes."



**BEN BEACH,** famous sportsman, says: "When I've landed a big game fish I light a Camel, and feel as good as new."

**Camel's costlier Tobaccos  
never get on your Nerves**

